TWENTIETH BIENNIAL REPORT AND FINANCIAL STATEMENT

OF THE

STATE BOARD OF FISH COMMISSIONERS

FOR THE YEARS 1907-1908.

To the Hon. James N. Gillett, *Governor State of California.*

Sir: We have the honor to submit for your consideration, the following preliminary report as a brief record of the work and expenditures of this Commission covering the biennial period of the fifty-eighth and fifty-ninth fiscal years. Also the recommendations with respect to the changes in the fish and game laws of this State based upon our experience and close study of these important subjects, which we deem advisable.

For the purpose of comparison, we are submitting the financial statement for the fifty-sixth and fifty-seventh fiscal years to show the increase, both in resources and expenditures, also the decided increase in the number of arrests and total amount paid in fines over any other biennial period in the history of this Commission. This is due to the splendid results that have followed the establishment of a hunting license law, which in our opinion is the most popular law ever placed on our statute books. The returns on hunting licenses exceeded about four times the estimated number of the most sanguine.

Our full biennial report, which is now under compilation, will show more in detail the record of work performed at our different hatchery stations and other general work of the Commission.

FINANCIAL STATEMENT.

The resources and expenditures of this Commission have been as follows for the fifty-sixth and fifty-seventh fiscal years, ending June 30, 1906:

Fifty-Sixth Fiscal Year.

	Resources.	Disbursements.
Appropriation for support and maintenance of State hatcheries	$12,500 00	$12,500 00
Appropriation for restoration and preservation of fish	10,000 00	10,000 00
Appropriation for restoration and preservation of game	7,500 00	7,500 00
Steelhead Propagation Fund—		
Balance on hand July 1, 1904	625 33	
Drawn from fund during year		489 62
Balance on hand June 30, 1905		135 71
Game Preservation Fund—		
Balance on hand July 1, 1904	1,916 86	
Receipts from fines during the year	4,019 15	
Amounts drawn during year		4,620 55
Balance on hand July 30, 1905		1,315 46
Fish Commission Fund—		
Balance on hand July 1, 1904	7,325 52	
Receipts from licenses and fines	10,026 35	
Amount drawn from fund during year		12,377 57
Balance on hand June 30, 1905		4,974 30
Totals	$53,913 21	$53,913 21

	Resources.	Disbursements.
Appropriation for support and maintenance of State hatcheries	$12,500 00	$12,500 00
Appropriation for restoration and preservation of game	12,500 00	12,500 00
Appropriation for restoration and preservation of fish	10,000 00	10,000 00
Steelhead Propagation Fund—		
Balance on hand July 1, 1905	135 71	
Drawn from fund during year		135 71
Game Preservation Fund—		
Balance on hand July 1, 1905	1,315 46	
Receipts from fines during the year	5,295 89	
Amount drawn during year		4,888 80
Balance on hand June 30, 1906		1,722 55
Fish Commission Fund—		
Balance on hand July 1, 1905	4,974 30	
Receipts from licenses and fines	10,340 35	
Amount drawn from fund during year		10,255 54
Balance on hand June 30, 1906		5,059 11
Totals	$57,061 71	$57,061 71

Resources and expenditures of this Commission for the fifty-eighth and fifty-ninth fiscal years, ending June 30, 1908, were as follows:

FIFTY-EIGHTH FISCAL YEAR.

	Resources.	Disbursements.
Appropriation for support and maintenance of State hatcheries	$20,000 00	$20,000 00
Appropriation for restoration and preservation of game	10,000 00	10,000 00
Appropriation for restoration and preservation of fish	10,000 00	10,000 00
Game Preservation Fund—		
Balance on hand July 1, 1906	1,722 55	
Receipts during the year from fines	3,506 93	
Amount drawn during the year		3,532 31
Balance on hand June 30, 1907		1,697 17
Fish Commission Fund—		
Balance on hand July 1, 1906	5,059 11	
Receipts from fisherman's licenses	5,930 00	
Receipts from fines	4,039 23	
Amount drawn during the year		10,040 45
Balance on hand June 30, 1907		4,987 89
Totals	$60,257 82	$60,257 82

FIFTY-NINTH FISCAL YEAR.

Appropriation for support and maintenance of State hatcheries	$20,000 00	$20,000 00
Appropriation for restoration and preservation of game	10,000 00	10,000 00
Appropriation for restoration and preservation of fish	10,000 00	10,000 00
Game Preservation Fund—		
Balance on hand July 1, 1907	1,697 17	
Receipts during the year—		
From fines $7,425 93		
From hunting licenses 116,579 11	124,044 19	
From sale of deer hides 39 15		
Amount drawn during year		46,641 70
Bounty on 287 California lions, October 15, 1907, to June 30, 1908		5,740 00
Balance on hand June 30, 1908		73,359 66
Fish Commission Fund—		
Balance on hand July 1, 1907	4,987 89	
Receipts from fisherman's licenses	3,784 10	
Receipts from fines	8,683 69	
Amount drawn during year		11,064 64
Balance on hand June 30, 1908		6,391 04
Fund for Fish Distribution Car—		
Appropriation	7,500 00	
Amount drawn during year		5,458 76
Balance on hand June 30, 1908		2,041 24
Fund for Fish Repository in Tuolumne County—		
Appropriation	500 00	
Amount drawn during year		299 95
Balance on hand June 30, 1908		200 05
Totals	$191,197 04	$191,197 04

The following comparative table is interesting, showing the increase in the number of arrests from year to year and the amount of fines imposed during each two years for the past twelve years:

Biennial period.	Violation of deer law.		Violation of quail law.		Violation of duck law.		Violation of salmon law.		Violation of striped bass law.		Illegally used nets seized and confiscated	Total fines from all sources.
	No. of arrests.	Fines.	No. of arrests.	Fines.	No. of arrests.	Fines.	No. of arrests.	Fines.	No. of arrests.	Fines.		
1897-1898	11	$100	7	$40	14	$220	19	$200	8	$100	30	$3,125 00
1899-1900	37	735	3	350	6	220	18	900	47	805	23	5,779 00
1901-1902	75	1,600	97	1,775	30	545	23	2,400	26	185	28	9,497 00
1903-1904	135	2,035	109	2,344	30	375	15	1,040	69	1,340	47	11,738 00
1905-1906	172	4,355	106	2,270	75	1,530	39	3,350	103	4,120	59	23,154 90
1907-1908	196	5,230	102	2,337	63	1,124	27	2,900	153	5,401	85	30,122 25

We respectfully recommend the following amendments to the game laws:

Amend section 626 by making the open season for valley quail, rail, snipe, curlew, ibis, plover, or other shore birds to commence with the duck law on October 1st instead of October 15th, and close the season for ducks and these other birds on February 1st instead of February 15th, except the Wilson snipe.

We also recommend that a close season of two years be established on mountain quail and grouse or sage hen.

Amend section 626*c* by adding to the list of game birds protected at all times, the wild turkey, which is now being imported into this State.

Amend section 626*d* by reducing the bag limit on ducks from thirty-five to twenty-five, also to include black sea brant and to reduce the bag limit of quail, doves, snipe, curlew, ibis, plover, rail, or other shore birds from twenty-five to twenty.

We would also recommend that a law be enacted to prohibit the use of any trained animals or live blind to use as a means of approach for the purpose of killing any wild ducks or other waterfowl.

We also recommend the present hunting license be amended to include fishing or angling, the amount to remain the same, and to be used for both, or either, hunting or fishing, and the money derived from such hunting license sales be paid into one fund to be known as the fish and game preservation fund, into which fund the unexpended balances remaining in the fish commission fund and game preservation fund, respectively, shall be merged.

We recommend the following amendments to the fish laws:

Amend section 628, relating to crabs, by raising the present close season September and October, and establishing in lieu thereof a close season of four months beginning November 1st and ending February 28th. And to establish a close season for at least two years on lobster or crawfish.

Amend section 628*a*, relating to striped bass, by establishing a close season of six weeks from the 1st day of May to the 15th day of June, during which time (the principal spawning season of these fish) their capture by nets and seines shall be prohibited.

Amend section 632½, referring to steelhead trout, by removing the close season that existed during the months of September and October, and to open the season for the capture of steelhead trout in all waters of the State April 1st, and to extend to February 1st the following year.

Amend section 634 by reducing the mesh of net at which salmon can be taken from 7½ to 6½ inches, and reduce the mesh of net by which striped bass and shad can be taken to 5½ inches.

Amend section 636 by striking out the word "set" and substituting the word "use."

Amend the act of 1887, March 21st, referring to the vocation of fishing by reducing the amount of license fee to a citizen of the United States from $5.00 to $2.50 and raising the fee to any person not a citizen of the United States to $10.

We append herewith an additional statement of the condition of the game preservation fund, showing the amount remaining in this fund on February 1, 1909, from the sale of hunting licenses and fines collected, together with our estimate of expenses for game preservation to the close of the fiscal year, June 30, 1909.

Amount in license fund February 1, 1909		$106,276 00
Amount received for fines since July 1, 1908		4,161 00
		$110,437 00
Estimate of expenses of the Commission for game preservation for the next five months:		
Salary and expenses of 62 deputies and assistants, $7,560 per month	$37,800 00	
For rewards in conviction cases paid outside deputies, monthly average $450	2,250 00	
Expenses of Game Farm, monthly average $300	1,500 00	
Incidentals, including office rent, expressage, license tags, telephone, and telegraph, fuel for launches, cost of prosecutions in justice and superior courts, postage, stationery, etc., monthly average $660	3,300 00	
Repair and maintenance of car	500 00	
Bounty on lions per month, $600	3,000 00	
Hungarian partridges and pheasants (contracted for)	3,000 00	
Trapping and distributing quail and procuring and importing wild turkeys	4,000 00	
Proposed expenditures for Hungarian partridges	5,000 00	
		60,350 00
Balance		$50,087 00

N. B.—It should be borne in mind that it will be four months after the end of the present fiscal year, during which time no license money will be available and the average monthly expense of about $12,000—or, say, $48,000—must be provided for from our surplus. Also payment for cottage at Game Farm, amounting to $1,750, now being built under contract.

Respectfully submitted.

GEORGE STONE,
F. W. VAN SICKLEN,
M. J. CONNELL,
Board of Fish Commissioners.

REPORT ON RECEIPTS AND DISBURSEMENTS OF FISH AND GAME COMMISSION, TWO YEARS ENDING JUNE 30, 1910.

By PRICE, WATERHOUSE & Co., Chartered Accountants.

SAN FRANCISCO, September 15, 1910.

California Fish and Game Commission, San Francisco, Cal.

DEAR SIRS: In accordance with your instructions, we have made an examination of the books and accounts of the California Fish and Game Commission for the two years ending June 30, 1910, and we attach hereto the following schedules:

Statement of receipts and disbursements, year ending June 30, 1909, Exhibit "A."

Statement of receipts and disbursements, year ending June 30, 1910, Exhibit "B."

From the statements submitted it will be seen that the accounts have materially changed since July 1, 1908, inasmuch as the funds for the restoration and preservation of game and the restoration and preservation of fish have been discontinued altogether, and the game preservation fund and the fish commission fund have been merged into a fund called "Fish and Game Preservation Fund," which was created and approved on March 15, 1909.

For the year ending June 30, 1909, the fish and game preservation fund received credit for the sum of $136,064.84 from hunting and fishing licenses, fines and fish eggs sold to the German Government. In addition the following appropriations were made by the legislature:

Support and maintenance of hatcheries	$20,000 00
Restoration and preservation of game	10,000 00
Restoration and preservation of fish	10,000 00
	$40,000 00

For the year ending June 30, 1910, there was only one appropriation made of $20,000.00 for the support and maintenance of hatcheries, which fund also received credit for the receipts from fishing licenses sold, which amounted to $21,982.50.

We have limited our examination, in so far as the records of the two years above referred to are concerned, to the checking of all disbursements by the Chief Deputy, and to see that all hunting and fishing licenses issued for the year ending June 30, 1910, have been properly accounted for. Regarding the disbursements by the Chief Deputy we have seen vouchers or other acknowledgments for all, with the exception of two small disbursements amounting to $11.88. As no complete classification of the disbursements has been made, we are unable to make such a classification now, but we will outline a system which will provide for this in the future.

We have seen that all receipts from the sale of hunting licenses for the year ending June 30, 1910, have been properly recorded and accounted for to the State Treasurer, and we have seen acknowledgments from the State Controller stating that all fishing licenses for the two years which remained unsold have been properly returned to him. We have also seen a letter from the State Controller which verified the balances in the treasury at June 30, 1910.

The value of the hunting licenses printed for the season 1909–10 was			$165,750 00
which is accounted for as follows:			
Cash receipts during year		$126,734 35	
Less:			
Amounts applying to prior year:			
1909.			
July 6—Marin County	$905 00		
6—San Francisco County	1 00		
9—Siskiyou County	3 00		
12—Tehama County	2 00		
15—San Francisco office	2,338 25		
28—Amador County	2 00		
29—Alameda County	100 00		
Aug. 9—Modoc County	113 00		
21—Tuolumne County	10 00		
Dec. 21—Merced County	15 00		
		3,480 25	
			$123,254 10
Add:			
Amounts collected since June 30, 1910, applying on year 1909–10:			
1910.			
July 5—Riverside County	$1 00		
6—San Francisco office	2,221 00		
8—Imperial County	44 50		
12—San Mateo County	125 00		
15—Madera County	167 60		
15—San Benito County	1,060 00		
23—Sonoma County	576 00		
25—Inyo County	16 00		
25—Placer County	986 00		
		5,197 10	
		$128,451 20	
Unsold licenses, duplicates, etc.		37,259 00	
Express charges on remittances from county clerks to Sacramento		83 80	
Licenses still owed for by Inyo county clerk (5 at $10.00)		50 00	
		$165,844 00	
Less:			
Amount overpaid by San Diego County	$85 00		
$1.00 license changed to $10.00—Shasta County	9 00		
		94 00	
			$165,750 00

In addition to the work done by us on the accounts for the past two years, we have also checked the following on account of the present year 1910-11:

Hunting licenses printed by the Union Lithograph Company as follows:

Aliens, 500 at $25.00	$12,500 00
Nonresident citizens, 500 at $10.00	5,000 00
Resident citizens, 135,000 at $1.00	135,000 00
	$152,500 00

At the time of our audit, August 24th, the following had been issued:

	Alien.	Non-resident.	Resident.	Value.
San Francisco office	25	10	4,200	$4,925 00
Firms, etc.			5,350	5,350 00
Los Angeles office	5	5	2,500	2,675 00
Fresno office			200	200 00
A. F. Lea			50	50 00
Harry Warr			50	50 00
County clerks	305	300	113,900	124,525 00
	335	315	126,250	$137,775 00
Leaving unissued	165	185	8,750	14,725 00
	500	500	135,000	$152,500 00

We counted all the licenses which were unissued and those unsold in the San Francisco office, and we saw receipts for all licenses issued to county clerks, etc., with the exception of Inyo County, for 5 aliens, 10 nonresidents, and 1,000 residents' licenses forwarded on June 3, 1910. We found on August 24, 1910, that the San Francisco office had collected for—

Licenses sold		$9,535 00
Which was accounted for as follows:		
Mercantile National Bank, San Francisco (per certificate)	$9,436 45	
Cash on hand	23 55	
Checks on hand	24 00	
Board of health licenses issued	26 00	
Express charges on coin from Sacramento	14 20	
Sundry vouchers	15 75	
		9,539 95
Over		$4 95
Being:		
Unlocated difference	$2 00	
Interest on bank balance	4 60	
	$6 60	
Less:		
Bank collection charge	1 65	
		$4 95

It will be seen from the above that a small amount of the license sales has been withheld in order to pay for express charges and certain small items of expense which require immediate payment. We consider that all cash received from the sale of licenses should be deposited daily, and that a fund of say $100.00, or $250.00 if necessary, should be created, out of which all such disbursements can be made.

We notice that hunting licenses are printed by the Union Lithograph Company, in whose possession the dies for these licenses, we presume, are still held. It would seem to us to be an easy matter to get an additional lot of these licenses printed, and to any one in the San Francisco office who is familiar with the sale of such licenses they could be sold and the funds never reach the hands of the Commissioners. We think that the hunting licenses should come through the State Controller's office in the same manner as the fishing licenses. This would eliminate practically all chance of getting additional licenses printed.

The following amount of fishing licenses were received from the State Controller for the year 1910-11:

2,000 aliens at $10.00	$20,000 00
2,000 citizens at $2.50	5,000 00
	$25,000 00

At August 24, 1910, we found that of this amount the following had been sold:

1,274 aliens at $10.00		$12,740 00
1,088 citizens at $2.50		2,720 00
		$15,460 00
Which was accounted for by:		
Bank of California certificate	$10,457 50	
Remittances to State Treasurer August 9, 1910	5,000 00	
Cash on hand	2 50	
		$15,460 00

The licenses unsold in the San Francisco office were counted and found in order, and the licenses in hands of deputies were all verified by letters from the various deputies.

While the fishing licenses expire on March 31st of each year, the receipts from license sales have been considered as revenue applying on the following fiscal year ending June 30th.

We find that there are approximately $40,000.00 receipts from sale of licenses and $120,000.00 disbursements passing through the hands of the Chief Deputy annually, and that the only bond given by any one is for $2,000.00, from the president of the Board of Fish and Game Commissioners. This would appear to us to be entirely inadequate, and we would suggest that provision should be made for the bonding of the Chief Deputy and his cashier.

We have not checked any disbursements which have been made directly through the State Treasurer, as we understand that such vouchers have all been passed by a Board of Examiners and also the State Controller's office.

We shall be pleased to give you any further information which you may desire.

Yours very truly,

PRICE, WATERHOUSE & CO.,
Chartered Accountants.

EXHIBIT "A."

CALIFORNIA FISH AND GAME COMMISSION, STATEMENT OF RECEIPTS AND DISBURSEMENTS YEAR ENDING JUNE 30, 1910.

Showing game preservation fund and fish commission fund combined (*law changed March 15, 1909*).

Game preservation fund. }
Fish commission fund. } *Fish and game preservation fund:*

Balance in hands of State Treasurer, July 1, 1908		$79,750 70
Less:		
June, 1908, expenditures		7,477 70
		$72,273 00
Receipts:		
Hunting licenses	$113,476 93	
Fishing licenses	6,647 50	
Fines	15,565 41	
Fish eggs sold	375 00	
		136,064 84
		$208,337 84
Disbursements:		
State Treasurer	$19,126 99	
Chief Deputy	112,557 83	
		131,684 82
Balance June 30, 1909		$76,653 02
Being:		
In hands of State Treasurer	$87,444 85	
Less:		
June, 1909, expenditures	10,791 83	
		$76,653 02
Support and maintenance of hatcheries fund:		
Appropriation for year	$20,000 00	
Disbursements by State Treasurer		$20,000 00
Restoration and preservation of game:		
Appropriation for year	$10,000 00	
Disbursements by State Treasurer		$10,000 00
Restoration and preservation of fish:		
Appropriation for year	$10,000 00	
Disbursements by State Treasurer		$10,000 00
Fund for fish repository in Tuolumne County:		
Balance July 1, 1908 (no change)		$200 05

EXHIBIT "B."

California Fish and Game Commission, Statement of Receipts and Disbursements Year Ending June 30, 1910.

Fish and game preservation fund:		
Balance July 1, 1909		$76,653 02
Receipts:		
Hunting licenses	$126,734 35	
Fines	19,789 27	
Game Farm earnings	938 22	
		147,461 84
		$224,114 86
Disbursements:		
State Treasurer	$38,163 71	
Chief Deputy	112,632 94	
		150,796 65
Balance June 30, 1910		$73,318 21
Being:		
In hands of State Treasurer	$89,275 04	
Less:		
June, 1910, expenditures	15,956 83	
	$73,318 21	
Support and maintenance of hatcheries fund:		
Appropriation for year		$20,000 00
Receipts—Fishing licenses		21,982 50
		$41,982 50
Disbursements:		
State Treasurer	$32,302 75	
Chief Deputy	9,679 75	
		$41,982 50

REPORTS OF SUPERINTENDENT OF SISSON HATCHERY, SEASONS 1908 AND 1909.

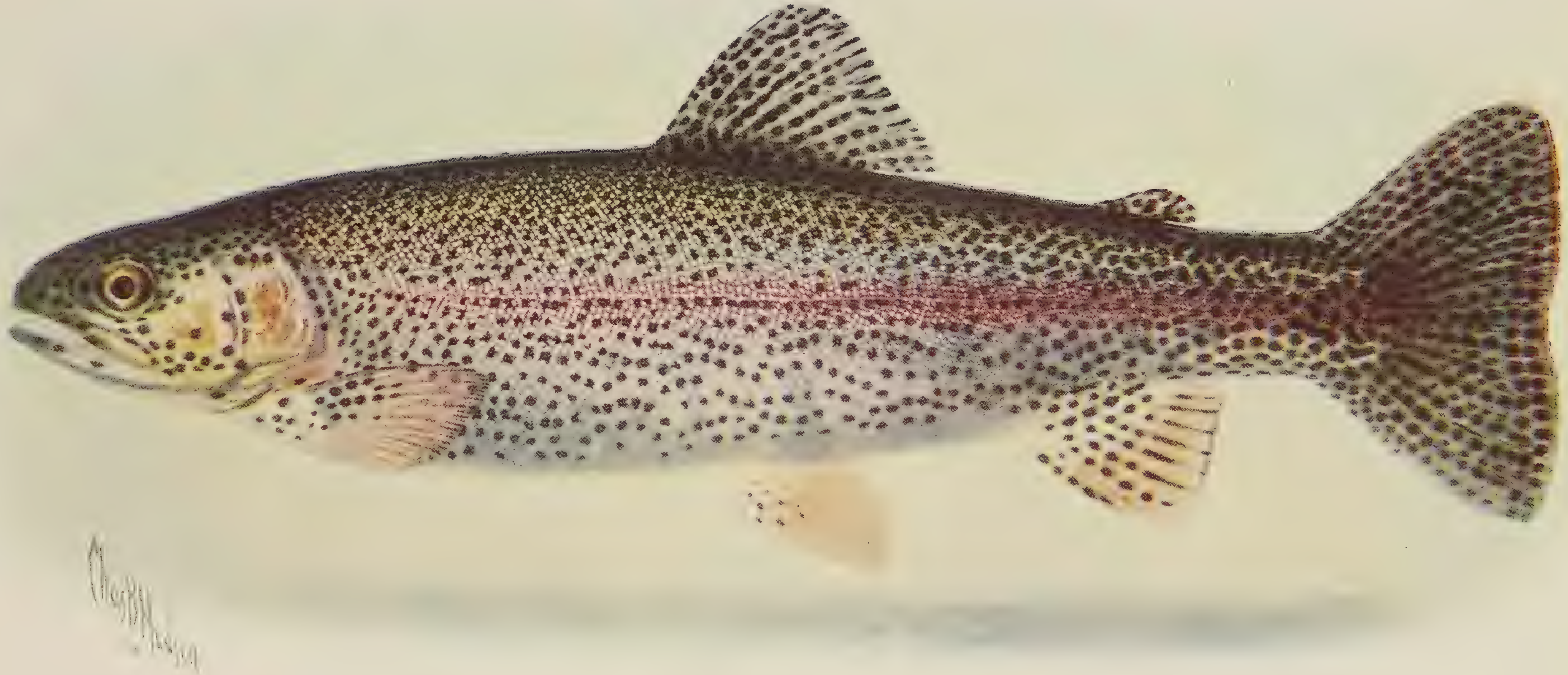
Sisson, Cal., November 30, 1908.

Honorable Board of Fish Commissioners, for the State of California.

Gentlemen: In accordance with the instructions of your honorable Board, I herewith submit a brief report of the work done at Sisson Station during the years 1907–1908. It is with pleasure that I can report the station in a prosperous condition—due in a great measure to the able support given to me by your honorable Board and Chief Deputy. I will endeavor to outline the principal work that has been done at this station in the last two years. During the period since my last report the necessary repairs have been kept up, new ponds constructed, a pumping plant for irrigating the grounds and for washing the ponds with water under pressure (through a hose and nozzle), the erection of a poacher proof fence around the grounds, the construction of a new hatchery for salmon work, the building of a raceway below the ponds, are among the main improvements.

The electric lighting plant has been enlarged by the installation of a new dynamo, and a new set of carbonized troughs has been set up in the hatchery "C." The source of our water supply has been changed to a point lower down on Spring Creek. When the Commission purchased the "Watson Tract" of land a water right and ditch went with it. The head of this ditch was in Spring Creek, a couple of hundred yards below the head of the old canal. The ground slopes on an even incline toward the hatchery, and the two ditches approach each other until they are parallel at a point a quarter of a mile from the hatchery. There we turned the lower ditch into the old canal. This was done to secure a steadier flow of water. At the source of the old canal are two other ditches that all have their source in the same dam, and as the flow was increased or decreased by the owners of these ditches, it caused us more or less trouble at the hatcheries, as we must have a steady flow of water. This change did not interfere with the flow of water in the old ditch or canal. The same amount has been in use at this station for the past seven years.

Several of the ponds were changed and new ones built to accommodate our increasing stock of brood fish. We now have at this station 45 ponds and four hatcheries for the rearing of fish. The hatcheries contain 300 troughs that are in almost constant use. A team of horses



RAINBOW TROUT (*Salmo irideus*)

DRAWN FROM CAPTIVE FEMALE FISH 11 3-4 INCHES LONG

and wagons have been purchased, and they have proved to be an economical investment. In the fall of 1907 we erected the fourth hatchery, "D," as we did not have room enough to handle the extra number of trout eggs that we were expecting to take, along with the salmon eggs. A building 50 by 75 feet was put up over one of the salmon batteries. It is a plain, substantial structure, with a corrugated iron roof. It is fitted up with the old troughs used in the salmon battery, and has been in use ever since it was built. Hatchery "A," the first building erected on the Sisson Hatchery grounds in the fall of 1888, is now in an unsafe condition. The foundation, sills, and floor are badly rotted, and the tank and wall on the north side are in the same condition. I would respectfully recommend that a new hatchery be built on a larger and more modern plan this coming season. The building is not safe any longer. We have repaired it several times in the last ten years. It is now in a state of decay beyond any repairs that are practical. In its place should be erected a modern building, fitted up with the latest and more improved system of hatching and rearing troughs.

The output of fry from Sisson Hatchery, for the years 1907–1908 is as follows:

1907.

Salmon fry	63,697,000
Steelhead trout fry	135,000
Rainbow trout fry	2,003,000
Eastern brook trout fry	826,000
Loch Leven trout fry	268,000
Sunfish	1,000
Rainbow eggs sent to the Philippines	25,000
	66,955,000

1908.

Rainbow trout fry	3,440,000
Eastern brook trout fry	1,780,000
Loch Leven trout fry	540,000
Steelhead trout fry	170,000
Total trout fry	5,930,000
Salmon fry	54,465,000
	60,395,000
Making a grand total for the two years of	127,349,000

In the spring of 1907 it was decided that the California Fish Commission and the Federal Bureau of Fisheries should coöperate in the work of collecting eggs on the Shasta River. A site was selected at the dam of the Siskiyou Electric Power Company, four miles from Yreka, Siskiyou County, as the place was favorable for a good take of eggs whenever there was a normal flow of water in the river, but, like all streams, when there is a flood it makes it difficult to operate a trap. The object of this station was to secure eggs from wild fish to improve the stock of fish in the ponds, both in the Eastern States and at Sisson Hatchery. On account of the season being late and the stream unusually high, only a small lot were taken. Three hundred and seven thousand of the eggs were sent to Eastern hatcheries by the Federal Bureau of Fisheries. In the spring of 1908 Shovel Creek Station of the California Fish Commission, an auxiliary of the Sisson Hatchery since 1890, was opened for the purpose of collecting rainbow trout eggs. This station had not been in operation for several years, as we had as many eggs from the ponds as our time and funds would allow us to collect and distribute. But with the prospects of a distributing car that the last legislature had provided for, we determined to increase our output by operating Shovel Creek Station.

We collected 1,350,000 rainbow eggs. Ten per cent of these were hatched at Shovel Creek Station and distributed in the creek above the hatchery. This was done to keep up the supply of fish in this, one of the finest streams for large spawning fish on the coast. Two hundred and fifty thousand eggs were sent to Germany at the request of the United States Bureau of Fisheries, and the remainder, 965,000, less the loss in eyeing, were shipped to Sisson. We again operated on the Shasta river in the winter and spring of 1908, and collected 836,000 eggs. The percentage of fertilization was small, owing to certain conditions that could not be avoided at the time. The Bureau of Fisheries took their share, 300,000, and shipped them to their different hatcheries on this coast and in the East. Since the distributing car was put in use this summer the fry have been held longer, and consequently they were larger than usual this season. During the latter part of the shipping season the fry averaged from 2½ to 3½ inches in length. This is as large as they can be successfully handled. The car greatly facilitated the work. It carried the fish in better condition than the old way of using dippers and cans, and allowed us to distribute a great many more fish than could have been done under the old system.

We can now increase our pond system and distribute more fry each season, so that every section of the State can be supplied. The pond fish have thrived and furnished the hatcheries with good eggs, cheaper than they could be collected from wild fish. By getting the eggs from the pond fish, we are insured of a never-failing supply of eggs without disturbing the fish in their natural state. The number of fish in the ponds at Sisson Hatchery December 1, 1908, are as follows:

Adult Eastern brook trout	5,300
Two-year-old Eastern brook trout	4,000
Yearlings	2,000
Fry	20,000
Total Eastern brook trout	31,300
Adult rainbow trout	11,150
Two-year-old rainbow trout	6,000
Yearlings	5,000
Fry	50,000
Total rainbow trout	72,150
Adult Loch Leven trout	4,000
Two-year-old Loch Leven trout	1,200
Yearlings	1,000
Fry	15,000
Total Loch Leven trout	21,200
Sunfish	3,000
Eighteen-months-old grayling	900
Adult steelhead trout	200
	10,000
	14,100
A total of all varieties	138,750

We have deposited a larger number of fry in the nurseries this season than usual, as we desire to select from them a strong, healthy stock of breeders. So far we have not heard of any results of the grayling fry distributed in the streams of this county. I have not had the time to make a personal investigation of the streams in which they were planted, but inquiry has failed to find any one who has seen or caught one. Probably we shall find them this coming season. They were planted in streams where they should thrive. Those in the ponds appear to be in good condition, and if we can keep them free from disease until they are old enough to breed, I am of the opinion that we will be able to get them introduced into our mountain streams.

It has been several years since we have had any Eastern brook trout eggs from wild stock, and I think that it would be advisable to get a small shipment from one of the Eastern stations, if the same can be procured, to improve our stock of pond fish. Eggs from wild Eastern trout can be gotten in this State another season, or from some of the lakes in Nevada.

The stock of Loch Leven trout that have been at this station for twelve years past have not degenerated, and those in the ponds appear to be as strong and vigorous now as was the original stock when they were first brought here. Like all other species of trout, they are subject to various diseases, but domestication and artificial food do not appear to change their condition.

The rainbow trout in our ponds are in good condition and show no signs of degeneracy. The only noticeable feature of the rainbow trout that has decended for several generations of pond fish is the increasing brightness in their colors and a changed appearance of their spots. Considerable could be written on this subject, but time and a closer study are necessary before going deeper into it. This is a study that will interest the ichthyologists and will be given more attention from now on.

In closing this brief report on the work of this station I beg to say that the encouragement and advice given to me by your honorable Board and Chief Deputy has greatly assisted me in making the work of this station a success.

Respectfully submitted.

[Signed.] W. H. SHEBLEY,
Superintendent Sisson Hatchery.

SISSON, CAL., September 1, 1910.

Honorable Board of Fish and Game Commissioners for the State of California.

GENTLEMEN: The Superintendent of the Sisson Hatchery submits the following report of the work and operations at Sisson Station for the years 1909-1910, up to September 1st.

The most important work during the last two years has been the construction of a new hatchery building, a cottage for the use of the foreman, a new feed house, wagon shed, a shed over the salmon rearing troughs, new flume and tanks at Shovel Creek Station; the building of a cabin, racks, and trap at Bogus Creek egg-collecting station; the removal of the pond keeper's cottage from the upper to the lower end of the hatchery grounds; the building of a new road and walk from the main hatchery (A) to the county road; the placing of redwood troughs in hatcheries "C" and "D," and the improvement in the pond work and the increase in the number of fish raised during the last two seasons.

After your honorable Board had approved the recommendations mentioned in the report of 1908 for the construction of a new hatchery to take the place of hatchery "A" that had been constructed in 1888, and was in such a state of decay that further attempts to repair it were useless, I submitted a plan of a hatchery 145 feet in length and 42 feet in width, to contain 100 hatching troughs, office, laboratory, also rooms for the men upstairs, storage rooms for tools, apparatus, etc.

The plan of the new hatchery was on entirely new lines, being similar to the plan I made for you two years ago for the Tallac Hatchery; that is, in regard to the arrangements of the troughs. The new system gives each trough a supply of pure water direct from the distributing tank. The troughs are arranged in sections of two each, placed side by side. There is an aisle between each section, and the main aisle or passageway is in the center of the building instead of on the sides, as in the arrangements of the old style of buildings.

The new hatchery was well built, all of the material used in its construction being selected stock. The lumber was selected for its durability and strength. The lumber in the troughs was all selected from heart red fir logs, and will last for years.

The building is well proportioned and on good architectural lines. The work of razing the old hatchery building was begun in the latter part of August, 1909. After the removal of the old building, and the foundation of the new one had been laid, the work was delayed for nearly three weeks on account of the serious illness of a member of the superintendent's family. Owing to the nearness of the dwelling to the hatchery site, the least noise would have been serious.

The rainy season began in the latter part of September, unusually early, and continued until December 1st. The work on the new hatchery was necessarily slow. The interior of the building had to be arranged first, and as much of it finished as possible, so as to have a place to hatch the trout eggs that were coming on during November and December.

During December and January the ground was covered with snow, and when the weather was not blustering and sleeting it was very cold, freezing the lumber whenever it happened to be damp and making it difficult to carry on the work. The men worked patiently under the prevailing conditions and finished the more important part of the work during the latter part of January. The new cottage was constructed during the same time. The old one (pond keeper's cottage) was removed early in the fall to the lower part of the grounds, so that the new one could be erected on the same site. The new cottage is well built, the material being selected for durability. The plan of this cottage was the same as the plan of the superintendent's cottage at the State Game Farm. It has five rooms, laundry, bath, fireplace and other modern conveniences.

We used the troughs taken from the old hatchery, that is, those that were not too much decayed, to make a battery of salmon rearing troughs. The iron roofing from the old hatchery was used to make a shed over these troughs. This battery was built to make more room for the salmon embryos, so as to relieve hatcheries "C" and "D."

Hatchery "A," the new building, will be used exclusively for the hatching and rearing of trout, particularly the eyeing of the eggs will be done in this building, as it can be kept in better condition than the buildings with the old style of boxes.

During the summer and fall of 1909, the troughs in hatcheries ''C'' and ''D,'' having been made out of soft timber, became very spongy, except a few that were carbonized a couple of years before, and it was deemed best to remove them, as the fry could not be kept healthy in troughs made from such material. I recommended that the troughs be changed and better ones substituted. My recommendation was approved by your honorable Board. After the salmon fry had been released, I tried to get selected lumber from the mills here, but as it was early in the spring there was not any chance to get the material necessary here, and redwood lumber was used.

We built 130 new troughs and put them into hatcheries ''C'' and ''D.'' Ninety were put into ''C'' and 40 into ''D.'' The other troughs in ''D'' were in good order.

In June, 1910, we built a straight road from the entrance to the hatchery grounds to the county road opposite, a distance of 630 feet. A sidewalk was also built of plank running parallel to it for the convenience of pedestrians.

The Sisson Tavern Company removed one of their barns, so that the Commission could build the road and walk straight from the hatchery to the county road. Owing to the uncertainty of getting rainbow eggs from the Shasta River Station, on account of the tremendous floods that came down that stream every spring, I determined to put in a rack and trap in Bogus Creek, four miles north of Thrall, on the line of the Klamath Lake Railroad. I had examined this creek years ago for the purpose of collecting rainbow trout eggs, but, owing to the almost impassable trail that leads down that canyon, I gave the plan up until after the construction of the Klamath Lake Railroad. In January, 1910, I ordered the material for a rack and trap, had it framed at Sisson, and shipped to Bogus Creek, where Mr. A. E. Doney, with the necessary number of assistants, put them in place.

We also put up a small cabin for the men. Mr. Doney successfully handled the trap and other work connected with the station. We secured a lease for the privilege of operating on the creek and land enough for the tanks and cabin. The lease gives the Commission the privilege of operating an egg-collecting station each season for the period of ten years, the station to be closed each season by April 1st.

This is late enough, for the spawning season on the Klamath River and its tributaries is practically over. The work of carrying the eggs from the canyon where the trap is located to the railroad bridge was very hard work. After the eggs were brought to the railroad track they had to be taken on a hand car to Thrall, where they were transferred to the Southern Pacific Railroad, and then taken to Sisson.

The operations at this station were very successful. There were collected 2,000,000 fine rainbow trout eggs. The fertilization was good. Mr. Requa spawned the fish and cared for the eggs en route to Sisson.

Shovel Creek Station furnished 1,100,000 eggs. A larger number of eggs would have been taken, but a rise of water in the creek, which ran over the racks, allowed a great many fish to escape. Ten per cent of the eggs taken at Shovel Creek were hatched there, and the fry distributed in the creek. We took 5,000,000 eggs from the pond fish. This was the largest number of eggs taken from the pond fish since the pond work was begun. These, with the eggs from the Klamath River stations, gave us a total of 8,000,000 rainbow trout eggs for the season. They were hatched in good condition, and the fry show the benefit of the new arrangement of the troughs. Taking them as a whole, they are the finest lot of fish that were ever handled at this station.

The output of salmon fry for the season of 1909–1910 was lighter than it has been for several years past, owing to high water in the rivers and streams tributary to the Sacramento River, on which the United States Bureau of Fisheries stations are located. The high water washed out the racks and a large number of spawning salmon escaped. This caused the take of salmon eggs to be short for this season. We received 22,500,000 as the total take of the season. These were given extra care during the hatching period, and the fry were liberated under the most favorable conditions.

They will give better results than a larger number of eggs would if not handled so systematically. We have built a couple of new ponds in the last two years, making a total of forty-seven ponds and nurseries on the grounds.

The total number of fish on hand in the ponds at Sisson Station September 1, 1910, is as follows:

Rainbow trout:	
Adults	11,000
Two years old	2,000
One year old	8,000
Fry	40,000
Total	61,000
Eastern brook trout:	
Adults	7,000
Two years old	1,000
One year old	3,000
Fry	25,000
Total	36,000

Loch Leven trout:	
Adults	4,500
Two years old	1,300
One year old	8,000
Fry	20,000
Total	33,800
Adult grayling	100
Adult golden rainbow	20
Adult land-locked salmon	25
Adult sunfish	200
Two-year-old steelhead	100
Steelhead fry	10,000
Salmo mykiss fry	10,000
Golden rainbow fry	250
Total	20,695
	157,495

The number of fry distributed during the season of 1909 from Sisson Station is as follows:

Salmon fry	22,500,000
Rainbow trout fry	3,083,500
Eastern brook fry	1,220,000
Loch Leven fry	955,000
Steelhead fry	168,000
Total	27,926,500

The distribution of trout for the season of 1910 will reach about 8,000,000. The work of distribution is going on very successfully. The fry are in excellent condition and carry well. Owing to the drought it will be late in the season before the shipping is over. There is a scarcity of water in a great many streams, and the applicants will have to wait until the rain season begins before the fish can be distributed. It is too early to make any forecast as to the number of eggs expected from the salmon run this fall and winter. It depends on the weather—if sufficient rain should fall before the middle or twentieth of October, we can expect a good take of eggs at the Bureau of Fisheries stations.

The trout fry hatched at Sisson Station this season, of which a number are distributed, is as follows:

Rainbow	5,205,000
Eastern brook	1,000,000
Loch Leven	1,484,000
Steelhead	303,000
Salmo mykiss	150,000
Total	8,142,000
Rainbow eggs hatched at Shovel Creek	120,000
Grand total	8,262,000
Eggs shipped to other stations from Sisson, to be deducted from total—to Brookdale	25,000
Eggs shipped to other stations from Sisson, to be deducted from total—to Wawona	50,000
	75,000

Our next work was to get the seining ground in shape, which was done, and we commenced operations with the seine on the night of April 8th and continued until May 27th, with ranging success. The weather during that period was very favorable for our work. We caught 5,045 trout (males, 2,284; females, 2,761). The males averaged about 1¾ and the females 1½ pounds in weight. Number of females spawned, 2,700, averaging nearly 1,600 eggs to the fish. The total number of eggs taken for the season was 4,115,000. Shipped 400,000 eggs away from the lake—Wawona receiving 250,000, Morrill and Denton, Verdi, Nev., 150,000. The latter was given in exchange for rainbow eggs and Eastern brook trout fry, which were planted in the streams and small lakes in this vicinity. The work of distributing the fry at the different stations was taken up in July and continued until all were planted. Nearly all of the mountain lakes in this vicinity were stocked, and good reports have been received. Received instructions to close the stations as soon as the distribution was over. Glen Alpine was closed August 7th; Tallac, September 24th, and Tahoe on October 10th, so that the necessary improvements could be made at this station (Tahoe Hatchery) before the stormy weather set in. Mr. Matt Green was employed to renew the foundations for hatchery and cottage, and to cover the outside of the buildings with rough rustic and stain the same, and also build new porches. This work was completed on November 8th, and Mr. Green and crew moved to Tallac to build a four-room cottage for the attendants at the Tallac Hatchery. This work was completed during the early winter. I reported in the office at San Francisco, took a vacation, and was ordered to report to Mr. W. H. Shebley, superintendent Sisson Hatchery, which I did, arriving there on December 8th and remained during the winter months.

Season 1910.—Received instructions from your honorable Board on March 10th to start from Sisson for Tahoe to open the stations for the season of 1910; arrived in San Francisco on March 11th and proceeded to Tahoe on March 12th, arriving there on the evening of March 14th. Upon my arrival in Truckee I found that the Lake Tahoe Railway and Transportation Company people had their road open, so it made it much easier to reach the lake than last year. My assistants, Messrs. Anderson, Calkins, West and Shaw, were in Truckee and joined me on the trip. March 15th visited the hatchery, and found everything in good shape and very little snow for this time of year. Crew started for Tallac to place hatchery in order and commence operations with the seine March 16th. Inspected the buildings and found everything in good order, also that Mr. Green had built a very neat cottage for the attendants.

March 17th to 26th: Routine work, getting things in shape at the hatchery and seining ground; also building new bulkhead at the mouth

In the work of construction at Sisson Hatchery, Chief Deputy Vogelsang greatly assisted me in furnishing practical ideas in regard to the color schemes in painting and other valuable suggestions. His untiring zeal has in a great measure helped me to make Sisson Station one of the most successful fish cultural stations in the United States. We are now prepared to carry on successfully the most modern and improved methods of fish cultural work. The kindly appreciation of my work by your honorable Board has been fully realized. It has encouraged me to do my very best for the interests of the Commission and the State.

Respectfully submitted.

W. H. SHEBLEY,
Superintendent Sisson Station.

REPORT OF SUPERINTENDENT TAHOE HATCHERIES.

YEARS 1908-1909.

To the Honorable the Board of Fish and Game Commissioners.

GENTLEMEN: I herewith submit by detailed report of the work covering the seasons of 1909 and 1910.

Acting under instructions from your honorable Board, I started for Tahoe on March 5, 1909, to open the stations for the spring and summer work. March 6th arrived in Truckee with my assistants, Messrs. Anderson, Calkins, West, and Shaw. We proceeded to Tahoe City in sleighs, making the trip in seven hours. The road was in very bad shape and we had to walk several miles. Encountered snow from three to twelve feet deep en route.

March 7th I inspected the Tahoe Hatchery and buildings; found everything in good shape.

March 8th I started for Tallac with my crew to complete the interior of the new hatchery that was built during the latter part of the season of 1908, and to place the seining ground in shape to commence operations with the seine. The new hatchery building was erected for the State by Messrs. Lawrence and Comstock of Tallac, and the setting of the troughs and some unfinished outside work was done under contract by Mr. Matt Green. The building is a very substantial one. It is forty feet wide by seventy feet long, with a half pitch roof, and is covered on all sides with shingles, giving it a neat and attractive appearance. It has forty troughs, with hatching capacity for about three million eggs. It is supplied with water from Taylor Creek. A concrete dam was built on Taylor Creek some nine hundred feet from the building. The water is conveyed from that point to the hatchery in an eight-inch iron pipe, which is laid under ground practically all of the way.

of Taylor Creek to facilitate the seining. March 27th commenced operations with seine and continued until May 8th, with grand success. The present season has been the banner season in egg-collecting on Lake Tahoe in the history of the California Fish and Game Commission, as the following results will show: Number of fish caught, 7,250 (males, 2,981; females, 4,342); males averaging nearly 2 pounds and females 1½ pounds. Number of females spawned 4,194, they averaging about 1,500 eggs to the fish. Total number of eggs taken 6,130,000, of which 1,680,000 were shipped to the following State hatcheries: Sisson, 100,000; Wawona, 250,000; Ukiah, 400,000; Marin County, 100,000, and 830,000 exchanged with Morrill and Denton of Verdi, Nev., for Eastern brook trout fingerlings.

Our best spawning day was on May 7th, when we collected 965,000 eggs. We had several days during our spawn collecting seasons that over half million eggs were taken. The number of eggs hatched at the Tahoe stations this season will be about 4,000,000, distributed and hatched as follows: Tallac Hatchery, 2,250,000; Tahoe Hatchery, 1,050,000; Glen Alpine, 700,000; have been distributing fry from the Tallac and Glen Alpine stations for the past week to relieve the crowded condition of the troughs. The work of distribution at all the stations will be taken up in the near future and continued until all of the fry are planted.

Would respectfully recommend at this time that the Tahoe Hatchery have a new floor, head box and set of troughs; also that the water supply be placed in first-class shape and an iron pipe installed to convey same from the springs to the building. This work can be done at the end of the coming season.

Respectfully submitted.

E. W. HUNT,
Superintendent.

Tahoe City.

REPORT OF SUPERINTENDENT OF EEL RIVER HATCHERY.

GRIZZLY BLUFF, July 13, 1909.

To the Honorable the Board of Fish and Game Commissioners.

GENTLEMEN: The following is my report of the steelhead work for the season of 1909. The fish started running earlier this season than usual, making their first appearance in Price Creek on February 16th. The run continued until April 23d. The season was a very satisfactory one, and I took 438,800 eggs. The fry were distributed in Howe, Price, and Williams creeks.

The following is a summary of the work:

Total number of eggs taken	438,800
Total number of eggs eyed	373,000
Loss in hatching and rearing	24,000
Fry distributed—	
Price Creek	168,500
Howe Creek	174,500
Williams Creek	6,000
Total	349,000
Number of fish caught—	
Males	80
Females	107
Number of females spawned	94
Average weight of fish—	
Males	6 pounds
Females	11 pounds
Highest temperature of water	63 degrees
Lowest temperature of water	41 degrees

In conjunction with the work of taking steelhead eggs this season, I have replaced the shake roof on the hatchery with corrugated galvanized iron, as the old roof was in a very shaky condition. This will be a great improvement. I have also built a new settling tank, and replaced the old auxiliary flume with a new one built of redwood. These improvements were much needed ones and have added to the efficiency of the station very much.

Yours very respectfully, W. O. FASSETT.

Grizzly Bluff, June 11, 1910.

To the Honorable the Board of Fish and Game Commissioners.

Gentlemen: The following is my report for the season of 1910 on the steelhead work at Eel River Station:

The fish made their first appearance on February 21st, and prospects looked very favorable for a good average take, but lack of water in Price Creek at the time the fish were running caused the main body of the fish to spawn in the river, with the result that my take was very disappointing. However, the 200,000 eggs sent me from the Ukiah Station swelled my total to respectable proportions, and enabled me to distribute a nice lot of fish in this vicinity. The run of females was much larger than the males, and at the end of the season a number of the females had to be released owing to the lack of males.

The eggs received from Ukiah have provided some interesting data, and thinking it may be of interest I am including it in my report. The eggs were taken by Mr. La Motte on the 11th day of April and were received by me on the 28th of the same month. Upon being placed in the water several hundred hatched, although they were only seventeen days old. I placed all these alevins by themselves in a separate trough, and preserved specimens of them, and also of the others which hatched on the 3d of May, seven days later, and continued preserving specimens of each lot at intervals of a week until they were distributed. In comparing the advancement, the prematurely hatched alevins matured the same as those hatched a week later, and with no greater loss, and no apparent difference; the average temperature of the water during this period was 61 degrees.

Eel River at present is simply alive with young salmon about 3½ inches long, and their jumping out of the water all along the river is best illustrated by the heavy fall of rain drops on the river's surface. In the small creeks young steelheads about 1¼ inches long can be seen in countless numbers. All in all, every indication points to a still greater increase of fish in Eel River.

During the time I have been engaged in the steelhead work I have, with your approval, replaced eleven sections of old troughs, which have been in use twelve years, and am now engaged in replacing the platform and making other necessary repairs at the dam. After regrading the main flume where it has settled in places, and moving it in closer to the bank where it runs along the bluff, this station will again be in first-class condition.

The following is a summary of the season's work:

Total number of eggs taken	172,000	
Total number of eggs eyed	154,800	
Loss in hatching and rearing	17,000	
Eggs received from Ukiah Hatchery	200,000	
Loss in hatching and rearing	20,000	
Fry distributed—		
Price Creek	167,400	
Howe Creek	163,400	
Sweasy's Lake	4,000	
Total	334,800	
Number of fish caught—		
Males	32	
Females	65	
Number of females spawned	47	
Average weight of fish—		
Males	4	pounds
Females	6⅓	pounds
Lowest temperature of water	44	degrees
Highest temperature of water	70	degrees

Yours very respectfully,

W. O. FASSETT.

Grizzly Bluff, June 13, 1909.

To the Honorable the Board of Fish and Game Commissioners.

Gentlemen: The following is my report of the salmon hatch at this station for the season commencing December 7, 1908, and ending March 6, 1909. The eggs arrived in four shipments, as follows: December 7th, 1,000,000; December 27th, 1,500,000; January 5, 1909, 1,500,000 from

Mill Creek, and December 21st, 1,440,000 from Battle Creek, making a total of 5,440,000 salmon eggs received. The hatch was successful, and I planted in Eel River and Price Creek 5,374,200 good healthy fry.

The following is a summary of the work:

Eggs received	5,440,000
Eggs lost	49,600
Fry lost	16,200
Fry distributed	5,374,200

On the 17th of February, 1909, I received 52,500 silver salmon eggs from the Santa Cruz Hatchery. The eggs arrived in fair condition, with a loss of 1,800 en route. The subsequent loss of eggs to the time of hatching was 4,000, making a total loss of 5,800. There was practically no loss in rearing, so I distributed 46,700 fry. All of them were planted in Price Creek.

The following is a summary of the hatch:

Eggs received	52,500
Eggs lost	5,800
Fry distributed	46,700

Yours very respectfully,

W. O. FASSETT.

GRIZZLY BLUFF, June 11, 1910.

To the Honorable the Board of Fish and Game Commissioners.

GENTLEMEN: The following is my report of the salmon hatch at this station for the season commencing December 5, 1909, and ending March 23, 1910. The total number of eggs received was 6,000,000, and were received in four shipments, as follows: December 5th, 1,471,000; December 26th, 1,438,500; December 31, 1909, 1,541,000, and January 10, 1910, 1,549,500. The eggs were all shipped from Mill Creek and were as near perfect as possible, the loss being practically nothing. The hatch was most successful, and the fry were distributed in Price Creek and Eel River.

The following is a summary of the work:

Eggs received	6,000,000
Eggs lost	30,255
Fry lost	practically none
Fry distributed	5,969,745

Yours very respectfully,

W. O. FASSETT.

HUNTING LICENSE SALES BY COUNTIES AND FISH AND GAME COMMISSION.

In Fiscal Year 1907-1908.

Name of county.	At $1.00. Amount.	At $10.00. Amount.	At $25.00. Amount.	Total.
Alameda	$5,441 00		$325 00	$5,766 00
Alpine	60 00			60 00
Amador	1,079 00			1,079 00
Butte	2,325 00		50 00	2,375 00
Calaveras	972 00			972 00
Colusa	1,364 00			1,364 00
Contra Costa	1,560 00		100 00	1,660 00
Del Norte	322 00			322 00
El Dorado	1,062 00		25 00	1,087 00
Fresno	3,693 00		25 00	3,718 00
Glenn	698 00			698 00
Humboldt	2,818 00		25 00	2,843 00
Imperial	559 00			559 00
Inyo	806 00	$110 00		916 00
Kern	2,070 00		25 00	2,095 00
Kings	1,000 00	10 00		1,010 00
Lake	1,192 00		25 00	1,217 00
Lassen	444 00	80 00		524 00
Los Angeles	12,140 00	180 00	225 00	12,545 00
Madera	720 00		25 00	745 00
Marin	749 00	40 00	150 00	939 00
Mariposa	385 00	10 00		395 00
Mendocino (county clerk failed to act in this year).				
Merced	1,305 00	20 00	50 00	1,375 00
Modoc	450 00			450 00
Mono	184 00	10 00		194 00
Monterey	1,897 00	40 00		1,937 00
Napa	1,362 00		50 00	1,412 00
Nevada	1,260 00			1,260 00
Orange	1,946 00			1,946 00
Placer	1,523 00	10 00	50 00	1,583 00
Plumas	605 00	40 00		645 00
Riverside	2,342 00	10 00	125 00	2,477 00
Sacramento	3,581 00	20 00	250 00	3,851 00
San Benito	727 00	10 00		737 00
San Bernardino	3,304 00	10 00		3,314 00
San Diego	2,950 00	20 00	50 00	3,020 00
San Francisco	1,870 00		250 00	2,120 00
San Francisco (commission)	12,201 00	80 00	950 00	13,231 00
San Joaquin	2,750 00	10 00	25 00	2,785 00
San Luis Obispo	1,498 00	10 00	25 00	1,533 00
San Mateo	1,363 00		150 00	1,513 00
Santa Barbara	1,768 00	30 00	75 00	1,873 00
Santa Clara	3,805 00		50 00	3,855 00
Santa Cruz	2,020 00		25 00	2,045 00
Shasta	1,970 00		150 00	2,120 00
Sierra	321 00			321 00
Siskiyou	2,716 00	40 00	125 00	2,881 00
Solano	1,982 00	10 00	50 00	2,042 00
Sonoma	3,980 00		50 00	4,030 00
Stanislaus	1,112 00		50 00	1,162 00
Sutter	578 00	10 00		588 00
Tehama	1,180 00			1,180 00
Trinity	512 00	10 00		522 00
Tulare	2,380 00	70 00	75 00	2,525 00
Tuolumne	992 00		100 00	1,092 00
Ventura	1,509 00	30 00	25 00	1,564 00
Yolo	1,429 00		25 00	1,454 00
Yuba	901 00			901 00
Totals	$113,732 00	$920 00	$3,775 00	$118,427 00

HUNTING LICENSE SALES BY COUNTIES AND FISH AND GAME COMMISSION—Continued.

In Fiscal Year 1908-1909.

Name of county.	At $1.00. Amount.	At $10.00. Amount.	At $25.00. Amount.	Total.
Alameda	$4,184 00		$175 00	$4,359 00
Alpine	60 00			60 00
Amador	880 00			880 00
Butte	2,394 00	$20 00		2,414 00
Calaveras	736 00			736 00
Colusa	1,208 00			1,208 00
Contra Costa	1,288 00			1,288 00
Del Norte	369 00			369 00
El Dorado	947 00			947 00
Fresno	3,502 00	30 00	125 00	3,657 00
Glenn	672 00			672 00
Humboldt	2,550 00	20 00	25 00	2,595 00
Imperial	499 00	10 00		509 00
Inyo	816 00	100 00		916 00
Kern	2,511 00	10 00		2,521 00
Kings	950 00			950 00
Lake	929 00			929 00
Lassen	421 00	20 00		441 00
Los Angeles	12,055 00	70 00	100 00	12,225 00
Madera	619 00			619 00
Marin	800 00	30 00	75 00	905 00
Mariposa	340 00	20 00		360 00
Mendocino	832 00			832 00
Merced	1,341 00		150 00	1,491 00
Modoc	413 00			413 00
Mono	171 00	10 00		181 00
Monterey	1,958 00	10 00		1,968 00
Napa	1,398 00		25 00	1,423 00
Nevada	1,524 00			1,524 00
Orange	1,797 00		25 00	1,822 00
Placer	1,509 00		25 00	1,534 00
Plumas	608 00	10 00		618 00
Riverside	2,268 00	30 00	150 00	2,448 00
Sacramento	3,355 00	10 00	150 00	3,515 00
San Benito	793 00			793 00
San Bernardino	3,061 00	10 00		3,071 00
San Diego	2,854 00	50 00	25 00	2,929 00
San Francisco (county clerk)	1,202 00		50 00	1,252 00
San Francisco (commission)	13,822 00	170 00	775 00	14,767 00
San Joaquin	3,025 00		25 00	3,050 00
San Luis Obispo	1,528 00		25 00	1,553 00
San Mateo	1,299 00			1,299 00
Santa Barbara	1,701 00	20 00	75 00	1,796 00
Santa Clara	3,193 00			3,193 00
Santa Cruz	1,967 00	10 00	50 00	2,027 00
Shasta	2,083 00			2,083 00
Sierra	239 00			239 00
Siskiyou	2,578 00	20 00	150 00	2,748 00
Solano	1,873 00		75 00	1,948 00
Sonoma	3,967 00	10 00	50 00	4,027 00
Stanislaus	1,182 00			1,182 00
Sutter	540 00			540 00
Tehama	1,151 00	10 00		1,161 00
Trinity	506 00			506 00
Tulare	2,578 00		125 00	2,703 00
Tuolumne	1,027 00		25 00	1,052 00
Ventura	1,452 00	10 00		1,462 00
Yolo	1,383 00		25 00	1,408 00
Yuba	832 00			832 00
Totals	$111,740 00	$710 00	$2,500 00	$114,950 00

HUNTING LICENSE SALES BY COUNTIES AND FISH AND GAME COMMISSION—Continued.

In Fiscal Year 1909-1910.

Name of county.	At $1.00. Amount.	At $10.00. Amount.	At $25.00. Amount.	Total.
Alameda	$5,614 00	$10 00	$100 00	$5,724 00
Alpine	36 00			36 00
Amador	920 00		25 00	945 00
Butte	2,394 00		25 00	2,419 00
Calaveras	734 00			734 00
Colusa	1,270 00			1,270 00
Contra Costa	1,246 00		50 00	1,296 00
Del Norte	312 00			312 00
El Dorado	864 00			864 00
Fresno	4,059 00	10 00	125 00	4,194 00
Glenn	746 00		50 00	796 00
Humboldt	3,056 00			3,056 00
Imperial	445 00			445 00
Inyo	1,025 00	30 00		1,055 00
Kern	3,550 00			3,550 00
Kings	1,233 00			1,233 00
Lake	1,028 00			1,028 00
Lassen	468 00		50 00	518 00
Los Angeles	12,779 00	80 00	250 00	13,109 00
Madera	783 00	10 00		793 00
Marin	718 00	20 00	25 00	763 00
Mariposa	325 00			325 00
Mendocino	1,301 00	10 00	25 00	1,336 00
Merced	1,470 00	10 00	50 00	1,530 00
Modoc	406 00			406 00
Mono	185 00	50 00		235 00
Monterey	2,219 00	20 00		2,239 00
Napa	1,725 00		300 00	2,025 00
Nevada	1,581 00	20 00		1,601 00
Orange	2,200 00			2,200 00
Placer	1,686 00		100 00	1,786 00
Plumas	448 00	10 00		458 00
Riverside	3,227 00	20 00	100 00	3,347 00
Sacramento	3,418 00	20 00	150 00	3,588 00
San Benito	1,050 00	10 00		1,060 00
San Bernardino	3,594 00		25 00	3,619 00
San Diego	3,349 00	30 00	75 00	3,454 00
San Francisco	915 00		100 00	1,015 00
San Francisco (commission)	15,971 00	200 00	1,050 00	17,221 00
San Joaquin	3,220 00		25 00	3,245 00
San Luis Obispo	1,341 00			1,341 00
San Mateo	1,409 00		25 00	1,524 00
Santa Barbara	1,703 00	50 00	50 00	1,803 00
Santa Clara	3,487 00		125 00	3,612 00
Santa Cruz	1,970 00	10 00	50 00	2,030 00
Shasta	2,098 00	40 00	25 00	2,163 00
Sierra	164 00			164 00
Siskiyou	2,728 00	40 00	75 00	2,843 00
Solano	1,522 00		75 00	1,597 00
Sonoma	4,340 00		50 00	4,390 00
Stanislaus	1,415 00			1,415 00
Sutter	631 00			631 00
Tehama	1,115 00	20 00		1,135 00
Trinity	616 00			616 00
Tulare	2,923 00		75 00	2,998 00
Tuolumne	986 00		50 00	1,036 00
Ventura	1,782 00	30 00	50 00	1,862 00
Yolo	1,450 00		50 00	1,500 00
Yuba	960 00			960 00
Totals	$124,210 00	$750 00	$3,400 00	$128,450 00

NOTES ON THE STRIPED BASS IN CALIFORNIA.

By N. B. Scofield.

The striped bass is to be found in the San Francisco Bay region or in the lower Sacramento or San Joaquin rivers, in varying numbers, in any month of the year. In the lower rivers, however, more of them are caught in the spring and autumn.

The spring run, as it is termed, is mostly of mature or "spawn bass," evidently ascending the rivers to spawn, and takes place during April, May and June. The average weight of these fish is between twelve and fifteen pounds. Thirty-pound fish are common and occassionally fifty and sixty-pound fish are taken.

The fall run on the rivers commences usually in September, the time being somewhat variable, and lasts from two weeks to two months. The fish of this run are smaller; immature bass, not often over five or six pounds, and according to the fishermen are bright, fresh run fish. The small sized bass are more apt to be found in schools, and the large catches in seine or gill net are usually of this size. In the lower bays they are often found on the flats voraciously feeding on schools of "sardines," making a sucking noise similar to that of the carp when feeding at the surface of the water. Often a school of these bass will run into one of the numerous tule lined sloughs of the Sacramento and San Joaquin delta, evidently attracted by the small river fish, which they drive before them, feeding as they go. Such schools are often indicated by a large number of shags, gulls, and fishing birds, which take this advantage to feed upon the maimed and frightened fish. Occasionally a fisherman is lucky enough to find one of these schools and will catch all his boat will hold.

The striped bass seems to be quite notional. It will suddenly appear on the river drifts and as suddenly disappear again, and no trace of them can be found. The fishermen who have now had fifteen or twenty years of experience fishing for them in these waters still trust mostly to chance in locating them, not being able to figure out their movements other than that rough water spoils the fishing, the theory being that they leave the flats and sloughs in rough weather and take to the deeper parts of the river where the nets do not reach them.

These bass are known to the river fishermen as winter bass. They ascend practically all of the sloughs at the mouths of streams, and run up the streams themselves.

The spring run. The San Joaquin River has been usually selected by this run, and they are taken by the fishermen in gill nets between Antioch and Bouldin Island. By far the largest portion of the spawn bass are taken near Bouldin Island. The fish are seldom taken above this point during the spawning season, but after spawning they ascend

STRIPED BASS (Roccos lineatus)

the rivers for long distances, or enter the sloughs or flooded lands in search of food, for after spawning they again become voracious feeders.

In the years 1903, 1904, and 1905 spawn bass were so plentiful about Bouldin Island that the fishermen, in order not to glut the market, agreed among themselves to catch no more than 600 pounds to the boat each twenty-four hours. They frequently got more than double this amount at one drift of a gill net.

Many of these fish were with mature eggs, and the fishermen all testify that the bottoms of their fish lockers were covered with eggs. Although bass with mature eggs may be found between December and June, almost all are found between the middle of April and the last of May. When the question of artificially hatching the striped bass came up, and a desirable place for a hatchery was looked for, Bouldin Island seemed the only logical place. A hatchery was built here in 1907, equipped with McDonald hatching jars and apparatus for getting the necessary water from the river. Before the hatchery was completed in April, many bass were being caught by the fishermen. The hatchery depended on the fishermen for any ripe eggs they might take. The fishermen took a lively interest and assisted in every way. Soon the capacity of the hatchery was taxed. At one time one fishing boat in one drift took eight female bass with eggs running freely, but there was room in the hatchery for the eggs of four of them only. From many lots of eggs no fish hatched. Other lots hatched 5 per cent only, and from that up to 50 and 60 per cent. One lot hatched a very high percentage of the eggs.

The results of the season's work were very encouraging, for hatching striped bass was still in the experimental stage, and the results in number of eggs hatched during this season of 1907 were much better than had been obtained on the Atlantic coast. It was not determined just why so many eggs failed to hatch, but it was laid to unsuitable water or some defect in hatchery method. The run of bass, while not up to the average, had been very satisfactory.

The season of 1908 found the hatchery better prepared for work and equipped with microscopes and apparatus for determining the cause of the failure of so many eggs to hatch. The run of bass was almost a failure, and the take of eggs so small that many of the experiments came to nothing for lack of eggs to experiment with.

It was soon found that the first cleavage of the germinal disc in the developing egg takes place about two hours after fertilization. So with the microscope it was possible to tell within two hours after the eggs were taken just what per cent was fertilized and developing. It was found that the loss of eggs was not due to bad water or any defective method of handling the eggs in the hatchery, but due to the nonfertilization of the eggs.

Where 40 per cent or more of the eggs from one fish were fertilized, they could be hatched without much difficulty. When there was a lower per cent of fertilization the unfertilized eggs became fungus infected, and between the twelfth and twenty-fourth hour after taking they became lighter than the water and rose and floated out of the jar with the current, no matter how slight this current was. These unfertilized eggs became attached to each other and to the live and developing eggs, and when they floated out of the jar they took many live eggs with them. In jars where there was only 10 per cent or 15 per cent of fertilized eggs, all might be lost in this way.

The milt of the male in nearly all cases showed active spermatazoa, thus narrowing the trouble down to the egg or the method of fertilization. Both the wet and the dry methods of fertilization were used, with no very appreciable difference. What difference there was, was in favor of the wet method. Frequently a lot of eggs were taken which did not swell properly in the water, showing they were immature.

Most of the lots of eggs taken were a pale green color, but a few lots had a golden green color. The golden shade is caused by a pigment in the germinal disc. It is probable that the eggs are not mature until this pigment is formed, but some lots hatched a small per cent of fish where the pigment did not show, and some with the pigment very noticeable hatched no fish. The better lots of eggs showed the pigment. We reached the conclusion that the trouble had been the eggs of the fish taken were slightly immature and incapable of fertilization.

We found that with the use of copper sulphate (1 part copper sulphate to 100,000 parts of water) it was possible to hatch lots where there was only 5 per cent of good eggs. The fungus growth on the outside of the bad eggs was killed and the good eggs would not adhere to them. A rather strong current could be turned on and the good eggs would remain in the jar and the bad ones would mostly pass out. The fish hatched from these eggs were just as strong as those hatched at the same time without copper sulphate. The young fish after hatching are able to stand this strength of copper sulphate. The yolk sac is absorbed seven days after hatching.

The run of bass at Bouldin Island during this season was very light. Most of the fish taken by the fishermen were quite green, and by the middle of May they caught both green fish and fish that had already spawned. The taking of a female bass with ripe eggs was evidently a lucky chance, and we had not been able to locate their spawning place.

A gauze tow net was used at different times during the season in the river, the sloughs, the flooded islands, and on the tule flats in the hope of catching a young bass just hatched, or eggs before hatching, and thus get some clue to where the striped bass spawns, but without results.

Season of 1909.—Having formed the theory that the striped bass caught at Bouldin Island are almost all sexually immature, and having so far been unable to locate their spawning beds, we hope that by penning the fish when caught they could be held until ripe. The penning of striped bass had been tried on the Atlantic coast without success and we knew they were exceedingly difficult to hold alive in captivity, yet we believed that with a sufficiently large pen, fenced off in the river, they could be held. By act of the State legislature the months of May and June had been made a close season on striped bass for net fishermen. We employed a fisherman with boat and suitable nets to fish during this time for the hatchery.

The run of spawn bass this season was exceedingly poor. Very few of the fish were to be found near Bouldin Island or on the river below. While ripe males were not uncommon, the females taken were most of them sexually immature. Only one apparently ripe female was taken, and from this fish only about 5 per cent of the eggs were hatched. The capture in the river of only green or spawned out fish would indicate that the river is not the place of spawning; but every conceivable place was fished during both the day and the night—the tule flats, the sloughs, the interior of the flooded island were fished with the result we were not nearer to the solution of the problem of where the striped bass spawn.

We built one pen in the edge of the river 3 by 40 feet in which the water stood about 6 feet deep at the outer edge and 2 feet deep at the inner side next the bank, with tules growing at one end and the rest partly overhung with willows.

We found that immature female bass and mature male bass caught in gill nets and carefully handled and placed in lively condition in this pen would live five or six days. The same kind of fish caught in fyke nets would live ten or twelve days. Female bass apparently nearly in spawning condition caught in gill nets could not be kept twenty-four hours. They injure themselves in some way when caught in the net and do not recover. We caught no nearly ripe females in the fyke net. Thinking possibly there was not current enough in the pen we had, we built a pen 16 by 20 feet by 5 feet deep, divided into two compartments 10 by 16 feet each. The framework was of 2 by 4 pine, and the sides and bottom covered with woven wire fencing. The pen was floated and anchored in the current of Potato Slough. The fish placed in this pen did not live as long as in the other. The current seemed to be too strong for them. In neither pen did they struggle to get out, but seemed not to recover from their struggles when caught. In all fifty bass were penned. Our experience would show that the striped bass can not be held in pens until they mature unless possibly the pen be made very large and so placed that the fish can be trapped and guided into the pen without handling.

There were several theories advanced to account for the poor run of bass in the San Joaquin River. For a year the dredgers had been active building up the levees and the silt and dirt thus stirred up might cause the bass to shun the river. Another theory was that the bass turned into and continued on through the flooded Sherman Island, whose levees had broken the year before, and continued up the Sacramento. The number of bass taken in the Sacramento was larger than the spring before, which seems to bear out this theory.

Another theory is that the bass are becoming scarce, due to the large catches and to the destruction of bass in the reclaimed islands when they were pumped dry. The scarcity of the bass in the San Joaquin may be due to all of these causes. Certainly immense numbers of bass have been destroyed in the islands. When the levees break the small river fish and carp enter the flooded lands and the bass also seem to prefer these islands for feeding grounds; and when the levees are built up again and the water pumped out, many tons of bass of all sizes are left.

The fishermen say that the sand bars and flats in the San Joaquin, which used to be of clean sand, are now covered with silt and trash stirred up by the dredgers, and they catch no bass now on these bars, where formerly they were often taken.

Most of the bass taken at Bouldin Island this season were taken in Georgiana Slough on their way through to the Sacramento. The catch on the Sacramento was larger than the year before, the largest number being taken in Steamboat Slough. The run was quite good in Cache Slough and Prospect Slough.

Season of 1910.—During this season two fishermen and boat were employed to fish for striped bass in the neighborhood of Bouldin Island, and another boat and two fishermen were employed to fish in Cache Slough and tributaries on the Sacramento side.

The run of spawn bass on the San Joaquin was better than the previous season, but all females taken were green and immature. Ripe males were taken in plenty. The river above Bouldin and all sloughs within ten miles were fished, the fishing being done mostly by night. The Mokelumne River was also explored. Bass were taken only near Bouldin Island mostly in the main river.

The Cache Slough country on the Sacramento was thoroughly explored. The striped bass are found in increasing numbers each year in this region. The greater number of bass are taken in Steamboat Slough, just above the mouth of Cache Slough, during the early part of the runs. Later they are found more plentiful in Cache Slough, where they are taken in nets in the main slough. Most of the bass running up Cache Slough turn off and ascend the clear water of Prospect Slough, through which they can reach the Big Lake, back of Clarksburg, and from there through inlets into the Sacramento again above the city of Sacramento. These sloughs and the Big Lake were pretty thoroughly fished during the bass run. Almost all the striped bass taken were very green and apparently not within several weeks of their spawning time. According to those familiar with the region, the striped bass come into Prospect Slough late in May and in June—a sort of belated run—and spawn in the main slough, but this season this run did not appear. The run here was earlier this season than last and evidently continued on up the river. They were reported as being seen early in May as far up as Tehama.

In the clear water of Prospect Slough the bass take the spoon readily, and this has become a popular fishing ground for those who enjoy the sport of catching the striped bass with rod and reel. The usual method is to troll behind a gasoline launch. Large numbers were taken this season in this manner; probably more pounds of fish than were taken by nets in Cache Slough.

If any future effort is to be made at hatching the striped bass, Cache Slough and its tributary, Prospect Slough, offer exceptional opportunities of trapping and impounding the bass in their early run up these sloughs. Prospect Slough is much of it narrow and not so deep, but that impounding nets could be set for catching them on their way up the slough. There should be no great difficulty in trapping the bass and leading them into an inclosure or blind slough, of which there are several, for they are readily caught in the small winged fyke nets used by the "cat" fishermen. The shallow Big Lake would be an excellent place for setting impounding nets. If the bass can be impounded and not be handled, as is necessary with seines and gill nets, they ought to reach the spawning stage in confinement.

N. B. SCOFIELD.

NOTES ON SPAWNING AND HATCHING OF STRIPED BASS EGGS AT BOULDIN ISLAND HATCHERY.

By N. B. Scofield and G. A. Coleman.

Examination of Lot "A," April 28, 1908, 6.30 p. m. to 9.00 p. m.

Both female and male had been caught about two hours and were dead when eggs were taken. Eggs taken at wharf at 6.30 p. m., spawned in a new dry tin pan, the milt spurted over them, then carried to the hatchery (about thirty seconds in transportation), about a pint of filtered river water added, and the eggs gently agitated by tipping pan for about one minute, more water added, and the milt decanted.

The milt from male was examined within five minutes after taking, but no movement of the spermatozoa was perceptible. The milt had a ropy, thick, white appearance, did not mix with water, but sank to bottom when put in clear water or normal salt solution. Eggs were taken from this lot, and milt, which had been caught in a vial of normal salt solution, added; the washing was done in distilled water, and they were placed in distilled water to swell, but did not swell at all.

April 29.—Eggs were taken at intervals and examined under the microscope, but no sign of segmentation could be found. Eggs were examined under high power of microscope for bacteria and fungus, but none could be distinguished. The eggs are constantly turning while floating to the top of jar and going over; an examination of these eggs shows that the germinal disc was broken or pinched off, and in some cases the yolk was ruptured. At 6.30 p. m. (twenty-four hours), fully 50 per cent of the eggs had passed off this way.

April 30, 7.00 a. m.—An examination of the jars showed that very few eggs were left, and these showed no signs of segmentation, hence jars were emptied. Specimens in mould dish were examined at 9.00 a. m. for bacteria and fungus, but none found. Examined again at 4.00 p. m., when it was found the bacteria (*Bacterium terms*) had developed in countless numbers. A distinct odor of putrid fish was discerned on opening dish.

4.00 p. m.—A number of males and females were examined on wharf, but no ripe ones found. Milt from these males showed no movements under microscope in three to five minutes.

Lot "B," April 30, 7.00 p. m.

This lot of eggs was from a female which had been dead about one hour, and male had been dead about the same length of time. Both eggs and milt were taken at wharf. Eggs taken in a new dry tin pan. The milt expressed directly over them. The pan dipped immediately (in about fifteen minutes) into river from side of boat. They were in this water with the milt while carried to the hatchery (about three minutes), and washed in water from overflow taken in the hatchery. Allowed to swell one hour before beginning to put in jars. The last of them remained in pan 2½ hours. About 25 per cent of this lot turned white before they were put in jars. A study of these eggs showed that no impregnation took place, just as in lot "A." The eggs swell, the germinal disc contracts and forms a cap on one side of the yolk. This cap remains in position up to about twelve hours, when it pinches off. The egg turns a whitish color, becomes buoyant and floats off through the siphon tube. A part of the eggs in this lot were taken in normal salt solution and milt, which was caught in normal salt solution applied. Specimens from these were preserved, and a study of them shows that they acted in just the same way as the others.

LOT "C."

Tried the experiment of taking some of this lot of eggs without milt and swelling them, placing them in a jar under same conditions as the impregnated eggs. They developed exactly as lots "A" and "B," and the germinal disc pinched off in just the same way. This is practical proof that the eggs will develop to this stage without impregnation, and also that impregnation did not occur in lots "A" and "B."

LOT "C," MAY 6.

Male and female alive and in prime condition. The dry method was followed. The self-straining bucket was used. This consists of a cylinder of perforated tin, fitting inside the regular collecting bucket, barring a space of two inches between tin and side of bucket. Water is poured over the eggs, and the movement of cylinder in the bucket strains off the milt. The first segmentation occurred in two hours, and it was estimated that 30 per cent of them would develop embryos, and 25 per cent of them did develop into fish. There was about 50 per cent died after developing into embryos, thought to be smothered from lack of circulation of water, due to collection of sediment on sides of jar.

The non-fertile and unimpregnated eggs passed over within twenty-four hours, just as in the first lots "A" and "B." A part of these eggs was saved and left in the jar to watch development of fungus and bacteria.

May 8.—The first trace of fungus was found on the dead eggs in the above jar within forty-eight hours after taking; specimens were removed to mould for study.

May 9.—The fungus consists of two species. One has the appearance of saprolegnia, the other a segmented form of a higher order, and both are in fruiting stage, showing that they develop very rapidly. So far no trace of the fungus on live eggs. In the case of the ripe eggs taken from spawned female, a small percentage of fertilization was obtained in a normal salt solution after eggs had been taken three hours.

LOT "D."

May 24.—Eggs from two females taken by McLeod. Milt from buck taken by McLeod at same time. Wet method employed by McLeod. Brought into hatchery half an hour after taking, with milt still on. Washed up in hatchery in four dish pans about 1,000,000 eggs. Apparently 30 per cent of segmentation at two hours. Apparently 25 per cent had turned white.

May 25.—Eggs disturbed at twenty-four hours by Ball, condensing the good eggs into three jars and pouring off bad ones.

May 26.—Do not seem to have suffered by handling.

May.—Twenty-five per cent of this lot hatched into fish.

Lot "E."

May 24, 8.00 p. m.—Eggs taken by McCrea from female which he thought was ripe. Milt from buck which he said was in prime condition. Dry method employed. Brought to laboratory in spawning pan. Was very white with milt which was stringy (not ripe). Washed up in hatchery. At two hours, about 1 per cent segmentation. Put in jars and kept twenty-four hours.

May 25.—No sign of embryos; hence thrown away.

Lot "F."

May 24, 9.00 p. m.—Eggs from spawned out female taken by "Nibsey," about 3 miles above Bouldin. Milt from male taken at same time. Wet method employed by Ball. Female had been very roughly handled in taking from net, but eggs had ripe appearance. Eggs taken in 3 gallons of water (about 20,000). Milt added and left for one hour; at two hours—50 per cent segmentation.

May 26.—About 50 per cent ready to hatch. Used for experiments with copper sulphate.

Lot "G."

May 25.—Eggs from a "spawned" female. Milt from buck taken half an hour later (not ripe). Wet method employed by McLaughlin. Brought into hatchery in self-straining bucket. In two hours about 50 per cent fertilization. Put in open jar.

Lot "H."

May 25.—Eggs from female taken by Woods. Milt from buck taken by Woods. Female in good condition and eggs apparently ripe. Male small and milt green (stringy). Wet method employed by Cassell. At two hours about 25 per cent fertilization; hence were not put in jars.

Lot "I."

May 28.—Female and male taken by McLeod. Eggs apparently ripe. Milt not very good. On questioning them closely, found they had taken the female from net, expressed the eggs in pan dry, added a little water to keep them moist and kept them in the water until they got a buck (about fifteen minutes), then added the milt. The eggs thus had time to begin swelling before milt was added. At two hours about 5 per cent of fertilization.

Lot "J."

May 28.—Female and male caught by Herman Wredt, about 3 miles up river from Bouldin. Said they were both ripe. Wet method employed. Eggs kept in gasoline can for two hours. Washed up in hatchery. Developed 25 per cent of fertilized eggs.

Lot "K." The Banner Lot.

May 28.—Female and male taken by Woods. Both in prime condition. (Eggs and milt ran freely.) Eggs a golden green color when taken. Milt white, but ran out like cream. Eggs taken in spawning pan, a little water added, and a *very small quantity* of milt added. The water was changed frequently in transporting eggs, as they were carried in boat for five hours. These eggs were taken in Disappointment Slough, some 14 miles from hatchery, and in the night-time. He had no bucket in which to place the eggs, so transferred them from spawning pan to a stew kettle, which he happened to have. In working with their engine, he would let eggs go for an hour or more at a time without washing. It was between five and six hours from the time eggs were taken to time they reached the hatchery. He washed them on arriving at his ark, and when they were brought into hatchery not a particle of milt could be seen on them, and there were very few dead eggs. All had a clear greenish color. There appeared to be 85 per cent of them fertilized when they were brought in.

May 30.—There were actually hatched from this lot out of 280,000, 227,000 fry, or 71 per cent, and this number planted in shallow water about 3 miles above Bouldin.

LOT "L."

May 28.—Male and female taken by ''Nibsey.'' Spawning and fertilization attended to by Grey. He thought these eggs ripe, but sample brought to the laboratory showed very dark green with white spots. He said fish were very roughly handled in taking from the net. In two hours about 5 per cent fertilization. Put up and kept twelve hours (no good eggs).

May 29.—Male and female taken by Woods. Eggs and milt taken by McLaughlin. Found a few eggs (about half pint) left in female when she was brought in by Woods. They were a light yellowish green, ran freely, and separated easily in water. The milt was examined and found to be not very lively; it came out in thick lumps. Wet method used. Eggs brought to hatchery in thirty minutes after taking. Washed in laboratory. Developed 50 per cent of fertilized eggs.

GENERAL CONDITIONS, TEMPERATURE OF WATER, ETC.

On Saturday and Sunday it was warmer than at any time this spring, bringing the water up to 66 degrees or 68, which brought a fair run of bass on Sunday afternoon and with varying luck during the week. The north wind seemed to stop the catching of bass, though a few other fish were caught. The sudden drop of the temperature on Thursday night, combined with a northwest wind, stopped the bass entirely, so that the first drift on Sunday, May 31st, yielded only one or two very small bass, and the second drift, Sunday night, only a few green males.

EXPERIMENTS WITH THE SPERMATOZOA.

Spermatozoa are active for about three minutes in water, after which time their swimming motion ceases. Placed on a microscopic slide they become attached to slide and cover glass by their tails, and their swimming ceases within one minute. Occasionally milt taken from a male does not show active spermatozoa at first, but after being left in a dish exposed for half an hour they become active when placed in water. If first they are placed in normal salt solution (.05 per cent), they will become very active on being placed in water. The salt solution seems to have a stimulating effect. The spermatozoa are active in water ranging from the temperature of freezing up to 90 degrees Fahrenheit. They are most active at temperature of 68 degrees Fahrenheit. They are killed at temperature of 100 degrees—110 degrees Fahrenheit. At a lower temperature than 42 degrees they are very sluggish. It was found that milt left in a dish exposed to the air, at a temperature ranging between 54 degrees and 68 degrees Fahrenheit, showed active spermatozoa after twenty hours.

We hope to demonstrate that striped bass eggs can be kept in an open dish and fertilized after several hours, as has been done with salmon and whitefish eggs, but all the lots of eggs saved for experiment happened to be from lots that turned out to be immature.

FOOD OF ADULT STRIPED BASS.

The food of the adult striped bass in the rivers is principally of carp, hardheads, and split-tails. Nearly all the fishermen claim that when the carp is plentiful it is their principal food. They even advance the theory that the bass are not so numerous in the San Joaquin because the carp are not so plentiful on the lower river, and they run up the Sacramento because of their great abundance in those waters.

FOOD OF YOUNG STRIPED BASS.

An examination of the stomachs of fifty young bass averaging 3 inches in length, which were taken at ''Morrison's Bite'' in Napa Creek on September 10, 1908, shows the following contents: Crustaceans, a species of Mysis, 30 per cent; of young shrimp, 15 per cent; of a species of Gammarus, 1 per cent; of an Isopod, 1 per cent, and 1 small crab. Marine worms or annelids, a species of Nereis, 45 per cent; of species not recognizable, 5 per cent; small fish, species not recognizable, 2 per cent.

It will, therefore, be seen that on this feeding ground, at least, marine worms comprise 50 per cent of the food, crustaceans of marine species 48 per cent, and small fish only 2 per cent. The young shrimp and young fish were taken from the stomachs of young bass of 3 to 4 inches in length and the other small crustaceans from the stomachs of specimens 3 inches and under in length, showing that the young bass begin feeding on the small species of crustaceans and worms, and as they grow in size are able to take the shrimp and young fish.

KEY TO FIGURES.

Fig. 1—Young striped bass—just hatched 80 hours from fertilization of egg.

Fig. 2—Young striped bass at seventh day.

Fig. 3—Young striped bass at thirteenth day.

Abbreviations. O.G., oil globule. Yk. Sc., yolk-sac. Br., brain. Ht., heart. St., stomach. An., anus. Bld., bladder.

The natural size of specimens is indicated by a line marked N.S. and all figures are magnified 15 diameters.

A study of the specimens shows that the yolk-sac is not entirely absorbed until after the seventh day, and that the stomach is not well developed until about the thirteenth day. The young fry were kept for two weeks in the McDonald hatching jar by removing the siphon tubes and replacing the top with silk bolting cloth, allowing a small stream of water to flow on the cloth.

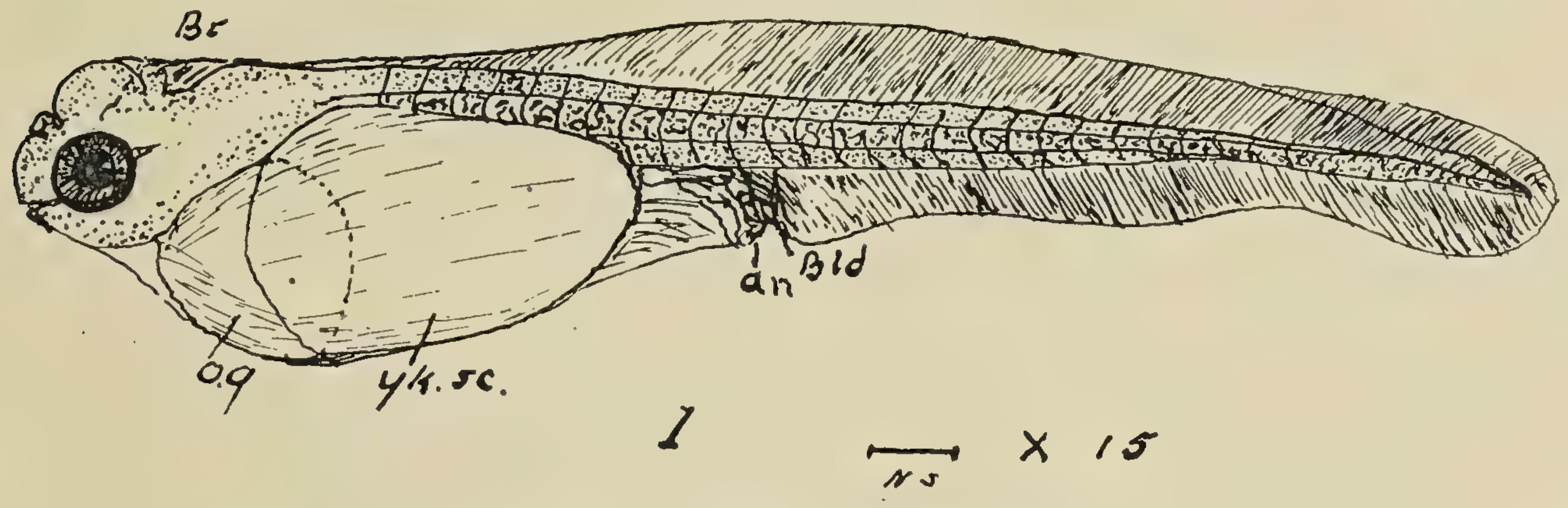


Plate 1. Young striped bass.

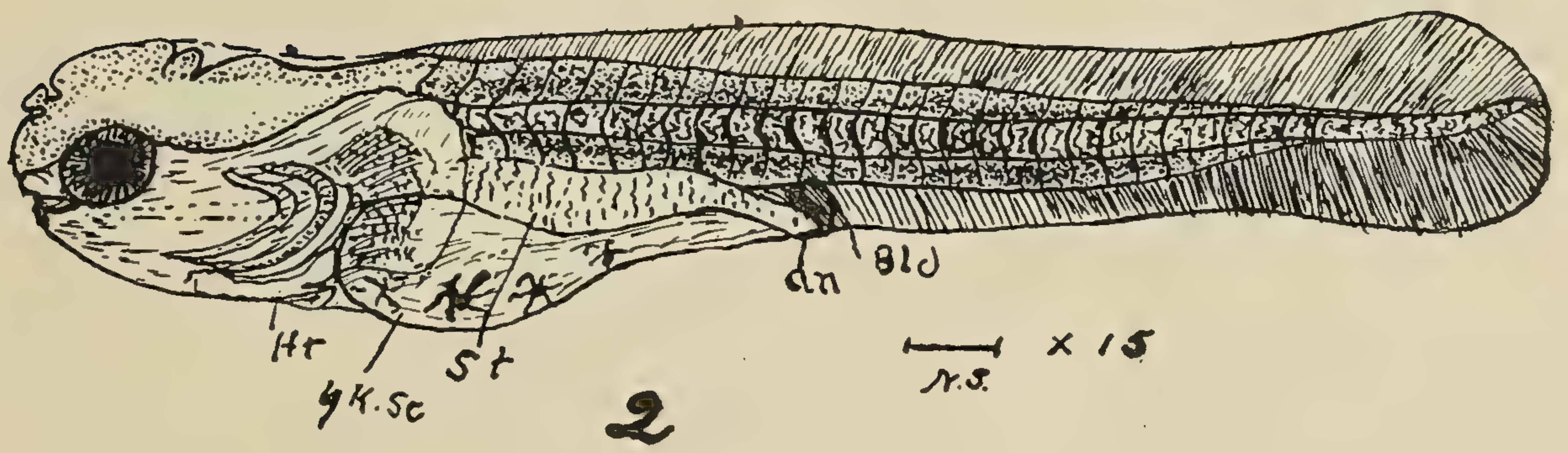


Plate 2. Young striped bass.

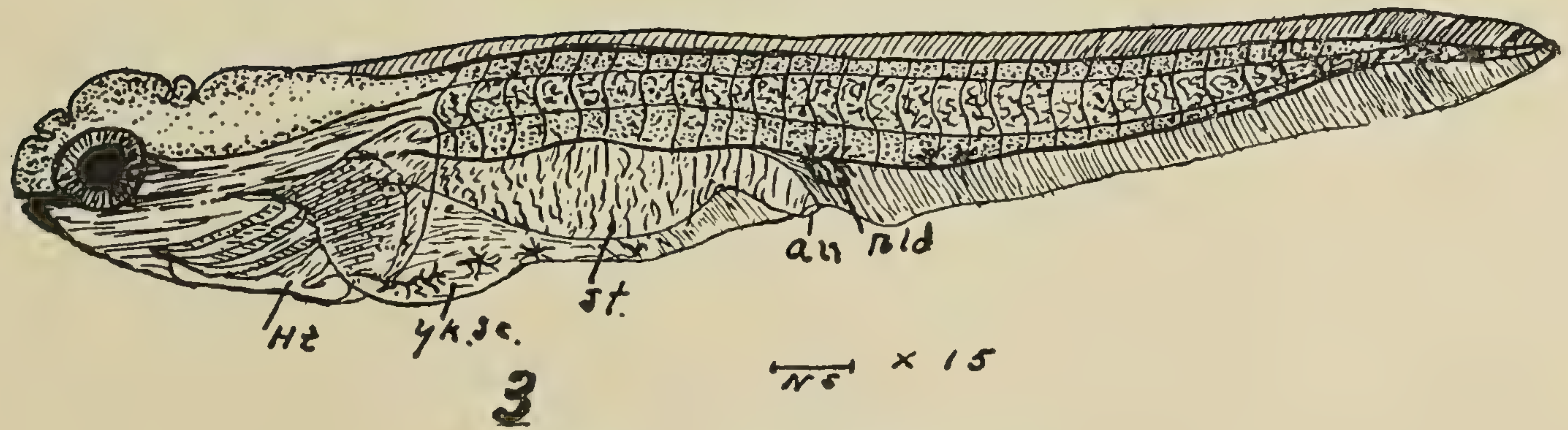


Plate 3. Young striped bass.

EXPERIMENTS WITH COPPER SULPHATE IN KILLING FUNGUS INFESTING THE EGGS IN HATCHERY JARS.

A number of experiments were tried to determine if this fungus can be killed by the use of copper sulphate without injuring the fish.

1. The fungus can be killed by application of copper sulphate (1–500,000 parts).
2. Fish or developing eggs are killed by application of copper sulphate (1–10,000 parts).
3. A small proportion of eggs are killed by solution of 1–25,000.
4. About 1 per cent of eggs are killed by application of 1–50,000.
5. The developing embryos will stand an application of 1–100,000 parts of copper sulphate without harm. This strength kills all the fungus and other organisms except small crustaceans.
6. It can be applied directly to the affected jars by dropping the required quantity into the jar and allowing the water to run as it ordinarily would.

Example.—A jar containing 5,000 c.c. of water would require one twentieth of a gram of copper sulphate to equal 1 part to 100,000.

It may be applied to the entire lot of jars by mixing and dissolving the required quantity in a small amount of water and adding it to the water as it runs in from the pipe.

Example.—If the water is running at the rate of 2½ gallons per minute (1,000,000 c.c.), it would require 10 grams of copper sulphate dissolved in 5 quarts of water and added slowly to water at head.

This experiment was actually tried and a lot of eggs which were infected with fungus left attached to the trough, also a lot which had been treated twice by dropping sulphate into jar. Neither one of these lots were affected. The fungus is thus cleaned out of troughs and it may all be flushed out by running in fresh water after the water with sulphate has been in for thirty-five minutes.

The copper sulphate may also be used in a strong solution for cleaning used jars. There is usually a coating of oil on the inside of jars after one lot of eggs has been hatched in them and on this oil a collection of fungus and other micro-organisms. The application of the copper sulphate cleans this oil off and kills all fungus or bacteria that may be collected on the sides of the jars.

Troubles.—A considerable amount of trouble was experienced with most lots of eggs in keeping them in the jars at about 12 to 24-hour stage. The bad eggs became attached to the good ones and carried them over. It was found that under the ordinary pressure about 10 per cent of the good eggs would go off in this way. An examination under the microscope of the eggs that were going off showed that they were connected by the fungus and other organisms which collect on the dead eggs and attach themselves to the good ones, one bad one sometimes having two or three good ones attached.

It was found necessary to turn the water off during this stage, flushing off the dead eggs occasionally in order to not smother the live ones. One of the jars containing the larger percentage of dead eggs and in which the carrying over was greatest, was treated with copper sulphate (1–100,000) twice (30-minute interval). The water was then turned on in a stronger current than usual. This jar was kept going all the time that the other jars were shut off. The dead eggs moved off slowly, and while the live ones were in constant motion they did not go out.

From this experiment it would seem that the fungus and micro-organisms were killed by the application of the copper sulphate, and when killed were removed from the eggs by the constant motion of the eggs. The dead eggs were thus carried off without their becoming attached to the live ones, and the necessity of turning off the water (which endangers the fish from lack of oxygen) to keep in the good eggs was avoided.

PHEASANT RAISING.

Arranged by CHAS. A. VOGELSANG.

INTRODUCTION.

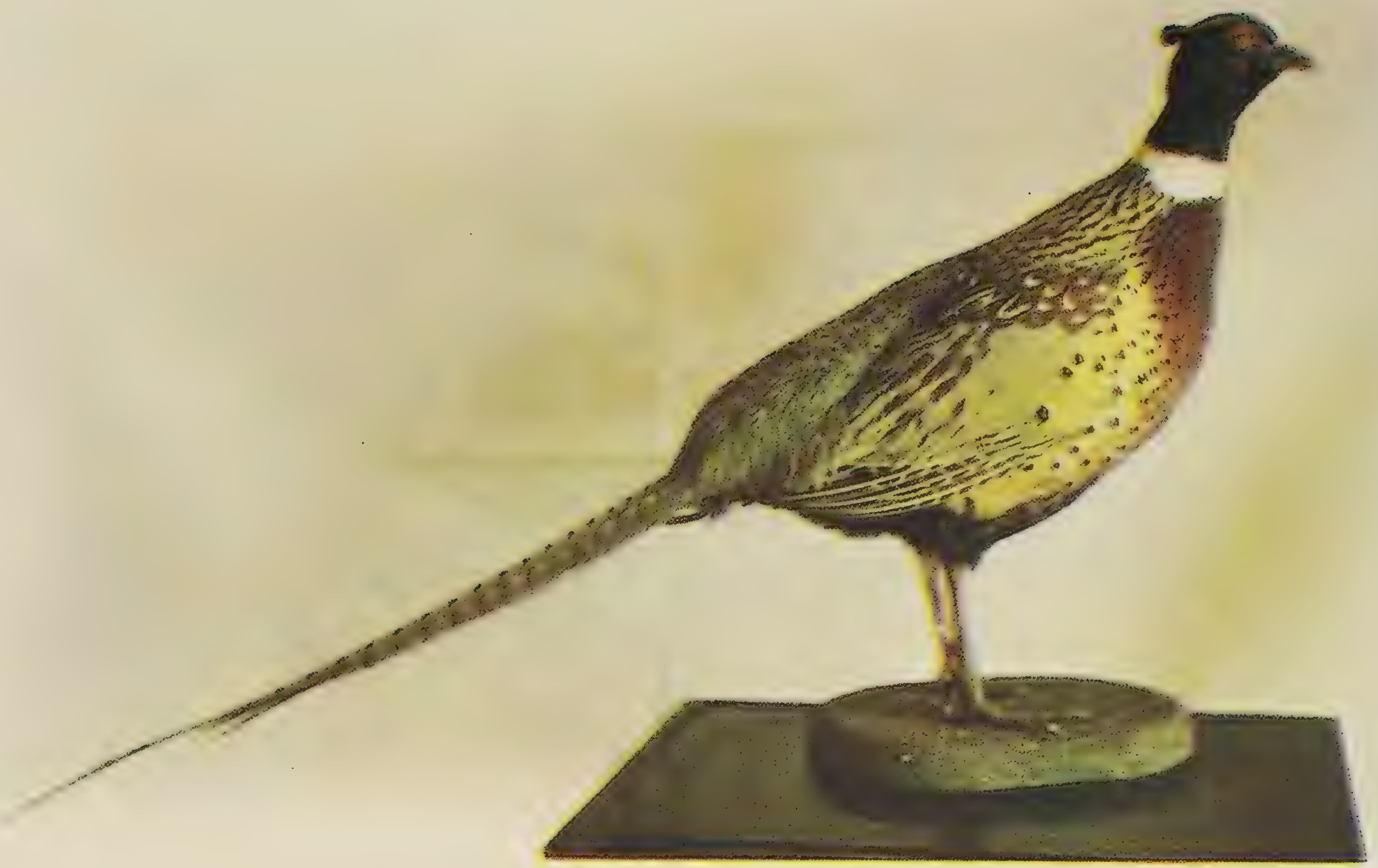
The State Fish and Game Commissioners, realizing that there is a strong and unsatisfied demand by hotels, restaurants, and by private citizens who do not hunt for wild game, and with a constantly increasing population, which renders it necessary to place greater restrictions (such as longer closed seasons and lessened bag limits) upon the amount of game that can be taken, believe that the situation could best be met through the establishment of a game farm, where pheasants and other game birds could be raised and distributed throughout the State, to people who would agree to give them proper protection and attention, and would take up the work of propagation seriously. The raising of pheasants in captivity has been carried on for years in European countries, and with considerable success in Eastern States.

It is the intention of the Fish and Game Commissioners to recommend at the forthcoming session of the legislature that pheasants raised in captivity can be sold in the markets. It would mean a new industry and would serve a double purpose. It would reduce the drain on wild game in the field, and give the profit that formerly went to market hunters to citizens and taxpayers who engage in a legitimate business.

At practically every session of the legislature for the past ten years some variety of game bird or animal has been added to the nonsale list, leaving wild ducks, wild geese and rabbits the only game that can be sold in the markets. It is only a matter of a very short time until wild ducks are added to the nonsale list.

The establishment of the game farm has been rendered possible by the hunting license law, which provides yearly a large revenue. Such a farm has been established near Hayward, Alameda County, at a cost of approximately $10,000, which includes in its equipment, houses, barn, water tank, pumping plant, pens, horse and wagon, necessary tools, and the original stock of birds. Our first year's work was performed under serious disadvantages. We raised, however, 1,200 pheasants. We expect to have 3,000 for liberation this year. All expenses in connection with this game farm are paid out of the hunting license fund, without taxing the general fund of the State one cent.

As an aid to those who are desirous of embarking in such an enterprise, we offer the following brief account of methods that have been proven successful by this Commission and other experienced breeders.



TYPE, MALE RING-NECK PHEASANT (*Phasianus torquatus*)

TRICHROMATIC PHOTOGRAPH TAKEN FROM MOUNTED SPECIMEN

We have quoted largely from Farmers' Bulletin No. 390 on ''Pheasant Raising in the United States,'' issued April, 1910, by the United States Department of Agriculture, and prepared by Henry Oldys, Assistant United States Biological Survey.

PENS.

The location of the pens is a most important factor. Well drained, sandy or gravelly land facing the south should be selected if possible, and the pens arranged to get all the sunshine possible during the wet months, as sunshine is one of the very best preventives of bird diseases. In hot locations the pen can be shaded when necessary.

A good sized pen or run for one cock and four hens would be about ten feet wide by sixteen feet long and six feet high. The sides and top should be covered with one-inch mesh poultry netting, carefully fastened and sunk into the ground *at least a foot,* to keep out burrowing animals. It is well to have an entrance at both ends of the pen for convenience in gathering eggs. A shed should be built in the north end of the run, with the side facing the sun, open. This shed should be at least four feet wide by six feet long and as high as the sides of the pen. A roost should be provided the length of the shed and a foot and a half above the ground. The *front of the shed must be left open* or the birds will not enter; the roof, rear and ends should be tight. When possible, it is well to enclose in the run small trees or shrubs for the birds to use as perches and for roosting; they will, besides, provide a shade during the hot summer months. Pheasants usually refuse to roost under cover; consequently, roosts of some sort must be provided in the open. Where more than one pen is used, they should communicate with each other, either directly or through a covered alleyway. This greatly facilitates the moving of birds from pen to pen.

It is absolutely essential that the pen be kept clean and free from lice at all times. The pheasant is a wild bird, with greater vitality than domestic poultry, yet conditions and diseases that affect poultry but slightly are fatal to the hardier bird. It is, perhaps, safe to say that most failures in pheasant rearing are due to filth and lice. We can not emphasize this fact too strongly; keep your pheasants in clean quarters and free from lice or you will lose them.

Before the beginning of the mating season it is advisable to move the adult birds to a fresh, clean pen. The ground in the old pen should then be spread with unslaked lime, allowed to stand two or three weeks, and then spaded up and planted to some grain or vegetable crop. All woodwork about pens and sheds should be sprayed or washed several times during the year with a good wash made with unslaked lime and water, to which has been added carbolic acid in the proportion of six ounces of acid to the gallon of wash. No whitewashing should be done during the laying season, as the hens are so affected by the odor as to stop laying.

HANDLING NEW BIRDS.

When a shipment of pheasants is received, first of all consider that they will feel strange and timid; therefore, they must be quietly handled. Place the crate in the pen, with food and water near by. After arranging it so that the birds can come out when they get ready, leave them and keep away from the pen, except when necessary to feed and water, as pheasants are easily scared when changed to new quarters. After a few days they will become accustomed to their new home and can be cared for without trouble. The same person should attend to the birds all the time if possible, and should always wear the same clothing when among them, as they are sensitive to any change of appearance and become frightened very easily. Strangers always bother the birds, and dogs and cats should never be allowed near the runs. Handle the birds only when actually necessary, and then only by grasping them *over* the wings and around the body. Never grasp them by the wings or legs, as is commonly done with poultry.

FEED FOR ADULT BIRDS.

Those foods that contain the elements and properties of their natural food supply, and to which they have been accustomed through centuries of feeding in the wild state, are naturally best suited to the pheasant in captivity. Do not overfeed, as it is sure to induce disease. The pheasant is a small feeder, needing only about half as much food as the chicken.

Variety in food is very important, as the pheasant in his wild state eats practically every edible substance he finds. Adult birds require feeding morning and evening, no more food being given them than will be cleaned up. We have found the best food to be a mixture made after the following formula:

Broken wheat (not screenings)	20 pounds
Fine (granulated) cracked corn	15 pounds
Oat groats	15 pounds
Coarse beef scrap	10 pounds
Millet seed	10 pounds
Canary seed	10 pounds
Rape seed	5 pounds
Hemp seed	5 pounds
Fine chicken grit	5 pounds
Fine granulated charcoal	5 pounds
	100 pounds

We should say at this point that none of the various poultry foods that we have tested has proven suitable for pheasants. The birds must have plenty of green ground bone at all times and be given an abundance of green feed, such as cabbage, lettuce, swiss chard, fine cut lawn clippings, clover or alfalfa. They like lettuce best. Pheasants get unthrifty at once if deprived of the green stuff they need. Fresh water in abundance *must* always be handy. Scald all watering dishes *every* day, and keep drinking water in the shade or change it often; warm water favors the development of bacteria that cause disease.

MATING SEASON.

The mating season will, of course, vary with the locality, but, generally speaking, it begins in April and extends into August. In captivity the pheasant hen lays from forty to seventy-five eggs. Nests are useless, as the hens will seldom use them, but drop their eggs on the ground anywhere in the pen.

The eggs should be gathered as soon as laid, or at least twice a day; otherwise the birds (particularly the males) will eat them. A sure cure for the egg-eating habit is to blow some eggs and fill them with melted soap and place in the pens. Eggs should be set as soon as possible; after they are fourteen days old they are unfit for hatching.

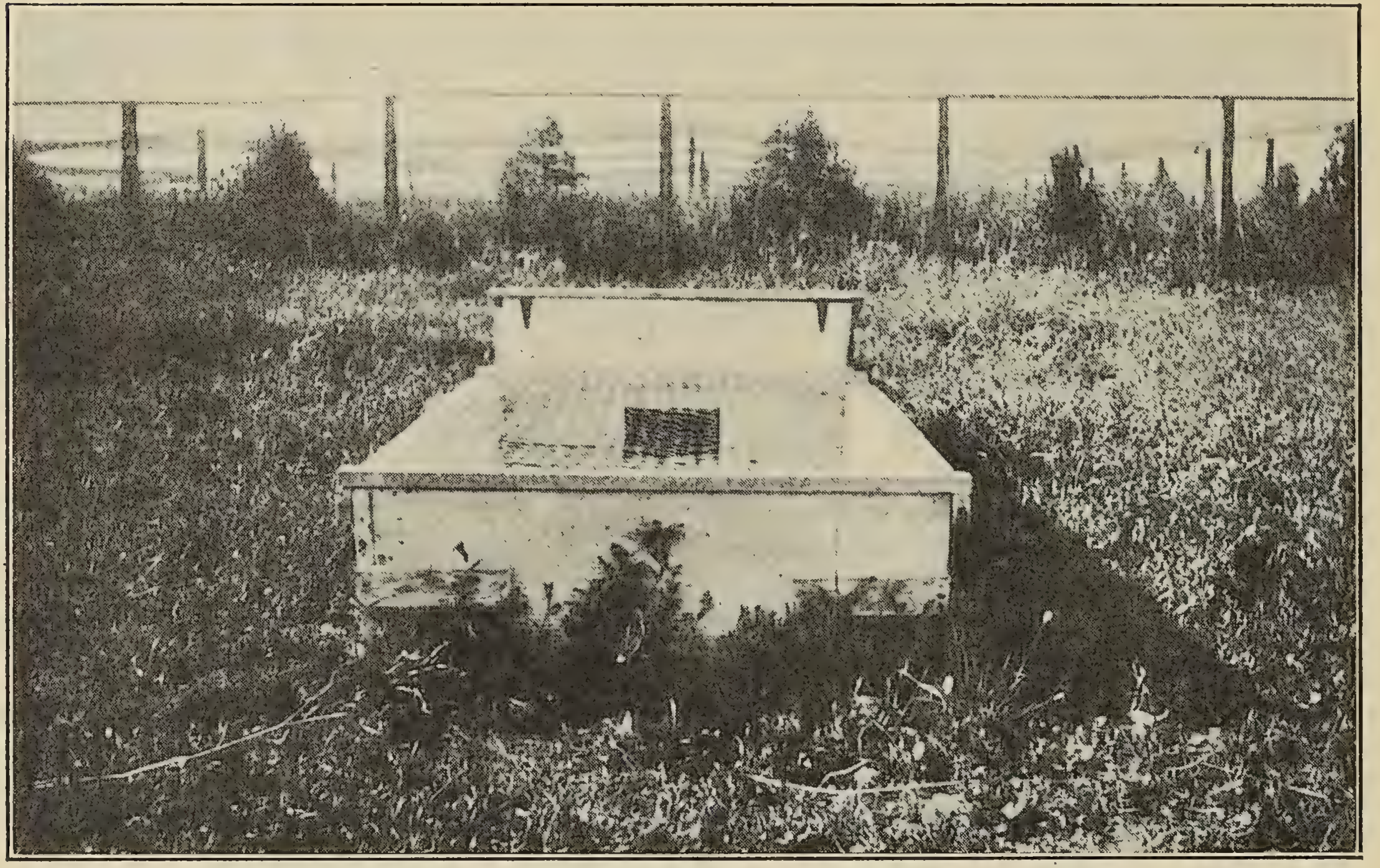
After hens have stopped laying for the season they can often be encouraged to resume by moving them and the male to a new, clean pen. The "lay" in the new pen sometimes exceeds that in the old one, and, of course, more than pays for the expense of extra pens.

HATCHING.

The pheasant hen in captivity is a poor mother; besides, it is more profitable to keep her laying. Wyandottes and Rhode Island reds make the best "mothers" for pheasant eggs and chicks, although any domestic hen will do, so long as she is a good "setter." Turkey hens are splendid mothers, as they are very quiet on the nest and careful with young birds. They seldom step on the chicks and are not so given to roaming as hen chickens are. The eggs must be set so that they will receive the benefit of ground moisture in a nest made after this plan:

Dig a hole *in the ground* in a shady place and shape a nest in it with excelsior; a handful of onion skins is a valuable addition, as they help to keep lice away. The nest should be enclosed with a box without a top and about twelve inches high to prevent the young birds from escaping as soon as they hatch. Before placing the hen on the eggs be sure that she is free from lice and disease, as lice are certain death to young birds and are the cause of most failures in raising pheasants. One insect feeding on top of a chick's head will kill the bird if not destroyed or removed. Dust the setting hen with some good lice powder, at least three times during the hatching period (but not within three days of hatching), and if at any time the young birds show evidence of being infested with lice, such as drooping and refusing to eat, dust them with lice powder and grease under their necks and on top of their heads with lard or olive oil.

From fifteen to seventeen eggs make a good setting for a chicken hen, while a turkey hen will cover from twenty to twenty-five. The period of incubation varies from twenty-one to twenty-eight days, although well fertilized eggs usually hatch on the twenty-third day, and all about the same time. The hen should be undisturbed during the hatching time and the young birds left in the nest until the youngest is a day old, as they need the ''mother's'' warmth for drying and strength-giving.



A coop for the mother and her chicks should be ready as soon as they are taken from the hatching nest. A cut and description of a very satisfactory coop is given herewith.

This coop (as shown) is three feet wide by six feet long and is twelve inches high, except in the hen's compartment, which is raised to twenty inches at the inner end. A space two feet long should be partitioned off at one end for the hen and an eight-inch opening left. This opening should be covered with slats spaced so that the chicks have just enough room to pass from one compartment to the other. The hen's compartment should be made with a hinged cover, to facilitate feeding and handling, while the runway should be covered with one-inch mesh netting, set in a sliding frame. It is a good plan to set the coop on a freshly cut grass plot and move it daily. The tender shoots of new grass form a wholesome part of the chick's food, and they are very fond of it, besides which, there is daily provided a supply of insect life.

After the chicks are four days old and know the call of their foster mother, they may be allowed to leave the coop after the morning dew has disappeared, and forage for themselves. Many breeders even allow the hen and her brood their freedom until the young birds show a disposition to fly out of the enclosure, when they transfer them to covered pens. Young birds cared for in this manner will be hardier and freer from lice and disease than those confined in coops.

THE FEEDING OF PHEASANT CHICKS.

It is important that the hen and her brood be fed separately. The young birds should not be fed at all until they are twenty-four hours old, as they come from the shell sufficiently well nourished to maintain their strength for that length of time, but they should have clean sand or fine gravel to pick at from the first. By the second day they will begin to get hungry and need feeding every two hours. After they are five days old, let the feedings be gradually reduced, until, at the expiration of three weeks, the birds are being fed but three times a day.

As soon as the young birds are ready to eat, they should be fed on a milk curd made as follows: Heat one quart of sweet milk to the boiling point, stir in ten eggs (well beaten) and then cook until the curd is well done. Strain off the watery fluid and you have a crumbly food that contains nearly all the elements essential to young pheasant life. A mixture of milk, eggs, and oat or corn meal in proportions to make a dry crumbly mixture is also a fine food. Boiled potatoes, mashed and mixed with finely chopped hard boiled eggs, corn meal, and bran—with or without finely chopped scraps of meat—provides a food that the young birds like. Still another suitable food is a mash of corn grits, wheat middlings, bone meal, beef scraps, and milk, made rather dry. In making curd, make only enough to last one day, as it spoils quickly, and sour food is death to the birds.

Maggots are the very best animal food for young pheasants. They are easily procured, and the chicks may eat as many as they desire with perfect safety. But maggots should not be given to the birds until they have lain in bran long enough to clean themselves. Maggots when taken direct from meat seem to be poisonous and are a dangerous food. Maggots may be procured in various ways, but we will describe but two plans, both of which have been used by us. Take crushed green bone and finely chopped meat, and place out doors until the mixture is well covered with fly eggs. Then fill a box or pan half full of bran, over which spread thin scraps of liver or meat for food for the maggots, and spread the flyblown green bone and meat on top. Another good method is to hang a beef or sheep head until the maggots get big enough to drop out. Then place a box of bran underneath and allow the maggots to lay in the bran a day of so before giving them to the birds.

Lettuce is a splendid food for young birds, and they should have it all the time. Fasten a head to the ground with a sharp stick and the birds will pick it off as they want it. Leave no remnants of food around the pens to become stale, and keep everything as clean and dry as possible. Dampness causes colds and gapes. Have plenty of fine grit and sand in reach at all times, and it is well to keep a pan with such food as is fed to the adult birds in the coop so that the youngsters may learn to eat it.

For watering the young birds, it is best to use the fountain jars that can be bought of any poultry supply house. The quart size is the best. Their drinking water *must always be fresh* and the fountain jars (and food pans) should be cleaned and scalded every day.

Usually the birds can be moved to the large runs by the time they are two or three weeks old. *Don't* put them with old birds. By the time they are five weeks old they may be fed anything they would find in the wild state. Young birds (as well as old) must always have dust or ashes to "dust" themselves in. This is their way of taking a bath and freeing themselves from insects.

DISEASES OF PHEASANTS.

By George Byron Morse, M.D., V.S.

In charge of investigations of diseases of birds and cold-blooded animals, United States Bureau of Animal Industry.

DISEASES AFFECTING YOUNG PHEASANTS.

Pasting.—Pasting occurs usually during the first week of life. The chick loses its vivacity, sits with eyes closed and its downy coat fluffed until it appears like a ball. Examination reveals the vent plugged or covered by a whitish, chalky, or pasty substance. This stoppage of the vent frequently leads to death in a day or two as the result of the absorption of putrefactive poisons due to retention of the feces. Treatment consists in the immediate, gentle removal of this chalky plug and the application of a few drops of sweet oil or a bit of petrolatum.

Diarrhea.—Whitish diarrhea may be caused in very young chicks by cold, by overheating, by overfeeding, or by too little or too much water. The observant fancier will come to recognize these conditions almost instinctively, and will relieve them by at once altering the régime. This should be all that is necessary. If more is required it is evidence that either the case has been permitted to run so long that the chick is too weak to recuperate or infection is operating.

White diarrhea of chicks, so dreaded by the poultryman, is an affection of pheasant chicks as well. The diarrhea is merely a symptom of a severe infection of the intestines, especially of the blind pouches or ceca, by a low form of animal life, known as *Coccidium tenellum,* and we therefore speak of the disease as an intestinal coccidiosis. The white coloration of the fecal discharge, as in the two previous diseases, is due to excretions from the kidneys. In certain virulent forms of the disease the minute blood vessels on the inner portion of the intestinal wall burst, and the bleeding gives rise to a dark brown or even blackish coloration, which obscures the white effect of the uric acid.

Treatment should begin with the administration of Epsom salts, mixing them in a mash and estimating from eight to fifteen chicks to one teaspoonful of the salts, according to age, size, and previous thriftiness. The drinking water should contain sulphate of iron (copperas) in the proportion of ten grains of the copperas to one gallon of water or enough permanganate of potash may be added to the drinking water, to give the water a claret-red color. The coops, feeding utensils, drinking vessels, and runs should be disinfected. As a preventive measure, incubators and brooders should be cleansed and disinfected, and, prior to incubation, whether natural or artificial, the eggs should be dipped in ninety-five per cent alcohol or in a four per cent solution of some good coal-tar disinfectant.

DISEASES AFFECTING MAINLY ADULT PHEASANTS.

Roup.—Certain affections known as contagious catarrh, diphtheria, and roup, if, indeed, they be distinct diseases, generally group themselves in the fancier's mind under the one name, roup. The term diphtheria should not be used, because it belongs properly to that disease in the human family which is caused by a special bacillus which does not cause disease in birds. The other two names may represent two different stages of the same disease, a contagious inflammation of the mucous membranes of the eyes, nose, mouth, throat, gullet, or windpipe, which may express itself by a watery, sticky, bad-smelling secretion, or by the development of yellowish patches.

In the treatment of these affections the first thing is to recognize the contagiousness and to isolate the sick birds. Disinfect the houses and ground. Make a mixture of peroxide of hydrogen and boiled water, equal parts; into this plunge the head of the affected bird. By means of a slender wire covered with a little absorbent cotton and dipped in this mixture clean out of the eye or scrape off the tongue and sides of the mouth all yellowish matter, and apply a four per cent solution of borax or boracic acid or the peroxide solution named above. Give all birds, sick and well, a dose of Epsom salts. Keep iron sulphate or permanganate of potash in the drinking water.

Enteritis.—Enteritis, as used in bird medicine, means inflammation of the intestines. While it may originate from cold, improper feeding, and the like, it is usually an infectious disease and calls for prompt cleansing of the digestive tract, which is best accomplished by Epsom salts or a teaspoonful of castor oil containing about fifteen drops of turpentine. Add iron sulphate or permanganate of potash to the water; isolate the affected birds. Disinfect thoroughly the houses, utensils, and grounds, and sprinkle lime everywhere. The causes may be coccidia, such as we find in white diarrhea of chicks; flagellates, as in the canker of pigeons; or bacteria, as in Klein's infectious enteritis.

Cholera.—Cholera would really come under the third class just mentioned. The organism causing it is frequently so virulent that death comes within a few hours, even before the diarrhea symptoms have had time to manifest themeslves. The treatment would be practically that outlined under enteritis, although treatment is usually of no avail. Kill the very sick and treat only the apparently healthy, thus anticipating and preventing the disease. Necessary in all the other diseases, it is of supreme importance in cholera to burn quickly all dead birds, after saturating them with coal oil. Burying deep and covering with lime may have to do, but it is not so good a method. In killing the sick birds do not use the ax, and thus spatter everything with the infective blood.

Scurfy legs.—The affection known as scurfy legs, scaly legs, scabies, or mange of the legs and feet is caused by a parasitic mite, *Sarcoptes mutans,* which burrows under the scales and by its presence sets up an irritation which causes a rapid increase in production of cells, together with a secretion resulting in a gradual thickening and elevation of the scales. Being a parasitic disease, scaly legs is transmissible from one bird to another and from infested houses, perches, nests, etc. Treatment must begin with isolation of the patient and the thorough application to the coops and fixtures of boiling soapy water, then kerosene, and finally a coat of five per cent carbolic acid, to which has been added enough lime to make a whitewash. The affected bird should have its legs soaked in warm soapsuds, this part of the treatment being completed by a good scrubbing with a small hand scrub. This alone has cured the disease. However, it is best to follow this with a good rubbing of sulphur ointment (one part flowers of sulphur to nine parts of lard, sweet oil, or vaseline).

GENERAL REMARKS.

Pheasants can be hatched in incubators and raised in brooders, but unless one has had much experience along those lines, it is best to resort to the domestic hen.

There are numerous other methods of raising pheasants, but from the success had with this one we recommend it as particularly satisfactory.

The best plan is to always follow nature as closely as possible and *beware of filth and lice.* For any information that you may desire which is not contained in this booklet, write to the "Superintendent of the State Game Farm, Hayward, Cal.," and he will give you such suggestions as you may need to make a success of raising pheasants. Any one going into the business extensively should have special instructions and must provide a different equipment.

IMPORTANT.

HOW TO LIBERATE GAME BIRDS.

If game birds are taken from the crates and left to fly, in their fright and desire to get away as far as possible from the crate, they will continue until exhausted. Such a flight will land them outside the lands they are intended for and will scatter them so badly that the pairs may never be reunited. If this is not the case, the exhausted birds will fall easy prey to predatory birds and animals.

To prevent this it is best to take the crate to some suitable location—in or near thick brush and with water at hand—and scatter plenty of feed about. Now quietly open the doors and go away from the crate, allowing the birds to leave in their own way—undisturbed by any one. If liberated in this manner, the game almost invariably will make its home close to the spot where it found its first food.

Birds should be liberated during the daytime so that they may get together, if scattered, and select a safe roosting place before night comes on. Where it is possible to do so, splendid results will be obtained by opening the crates in some old barn or ranch building and keeping the birds penned up for several days before allowing them their full liberty.

If the birds are fed and watered and left to themselves, they will recover from the effects of close confinement and traveling, and be in such condition that predatory hawks and "varmints" will do them no harm. When ready to liberate them, open a door and allow the birds to come out in their own way and time.

Game birds should not be liberated where their natural enemies are numerous. By trapping, poisoning, and other means, endeavor to kill off all predatory animals and such birds of prey as the great horned owl, sharp-shinned hawk, Cooper's hawk, duck hawk, butcher bird, and blue jay, before turning out any birds.

SMITHSONIAN INSTITUTION LIBRARIES
3 9088 01670 1815